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**Kitamura**

(10) **Patent No.: US 9,069,325 B2**
(45) **Date of Patent: Jun. 30, 2015**

(54) **IMAGE FORMING APPARATUS**

(71) Applicant: **Oki Data Corporation**, Tokyo (JP)

(72) Inventor: **Makoto Kitamura**, Tokyo (JP)

(73) Assignee: **Oki Data Corporation**, Tokyo (JP)

( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 56 days.

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(30) **Foreign Application Priority Data**

Sep. 13, 2012 (JP) ..... 2012-201590

(51) **Int. Cl.**
***G03G 21/16*** (2006.01)
***G03G 21/18*** (2006.01)

(52) **U.S. Cl.**
CPC ..... ***G03G 21/1633*** (2013.01); ***G03G 21/1619*** (2013.01); ***G03G 21/185*** (2013.01)

(58) **Field of Classification Search**
CPC ..... G03G 21/1619; G03G 21/1623; G03G 21/1633
USPC ..... 399/110–114, 118
See application file for complete search history.

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*Primary Examiner* — David Gray
*Assistant Examiner* — Carla Therrien
(74) *Attorney, Agent, or Firm* — Rabin & Berdo, P.C.

(57) **ABSTRACT**

An image forming apparatus includes an apparatus main body, and a visible image forming unit that forms a developer image. The visible image forming unit includes a first unit, a second unit detachably mounted to the apparatus main body, and a third unit. An image forming apparatus further includes a first mechanism that causes the first unit and the second unit to move toward or away from each other, a moving member that moves the first mechanism, and a second mechanism that causes the second unit and the third unit to move toward or away from each other in conjunction with a movement of the first mechanism.

**20 Claims, 27 Drawing Sheets**

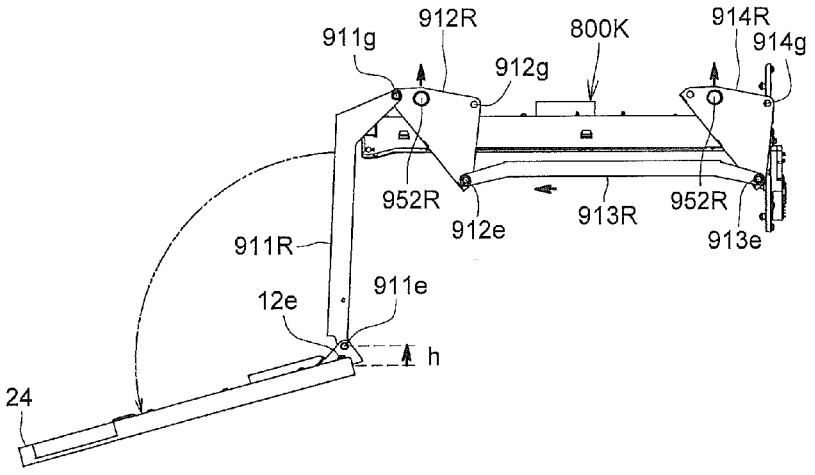
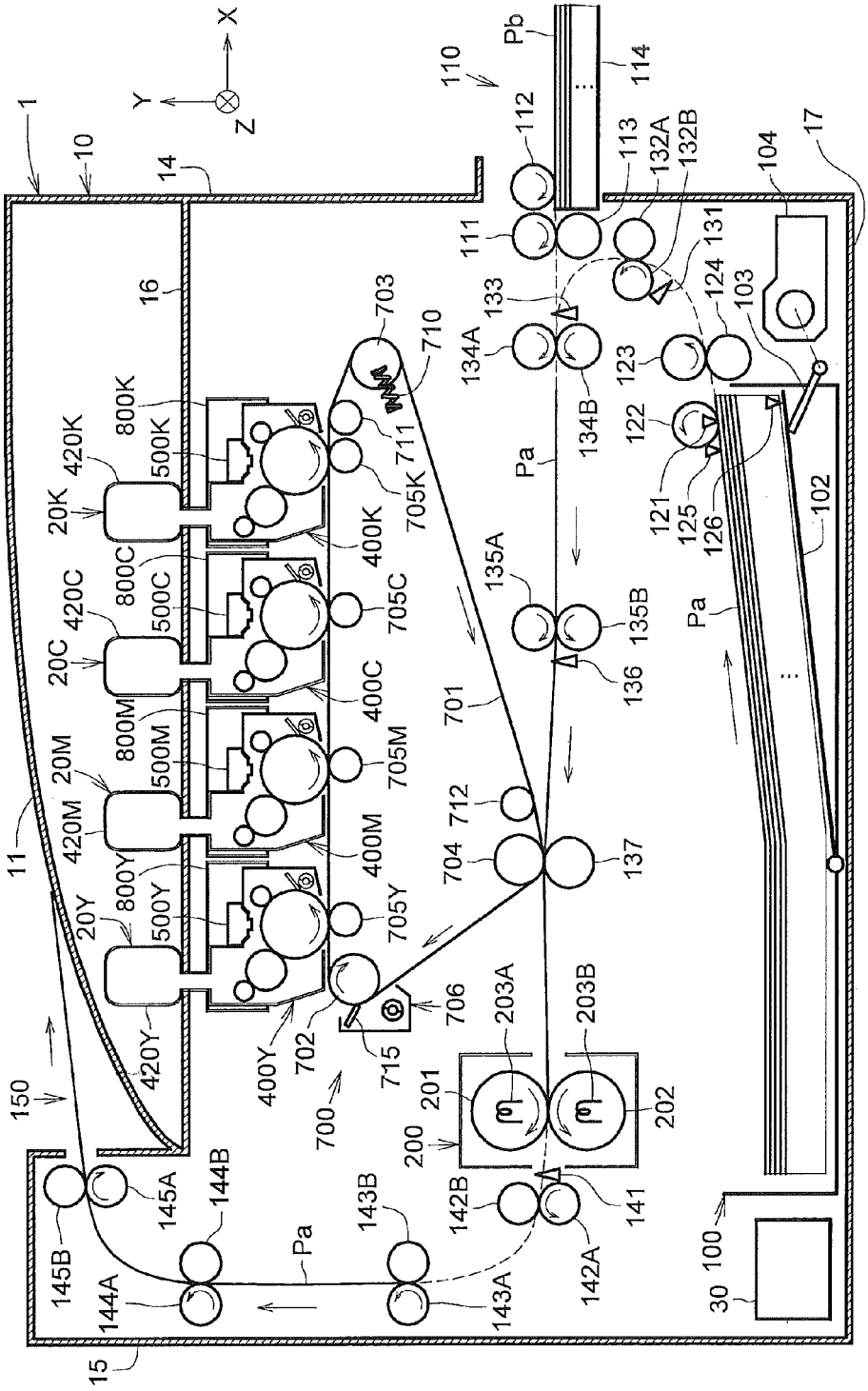


FIG. 1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103
133
134A
134B
123
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126
102
Pa
135A
135B
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701
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705K
705C
705M
705Y
400K
400C
400M
400Y
702
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700
704
712
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500K
420K
20K
800C
500C
420C
20C
800M
500M
420M
20M
800Y
500Y
420Y
20Y
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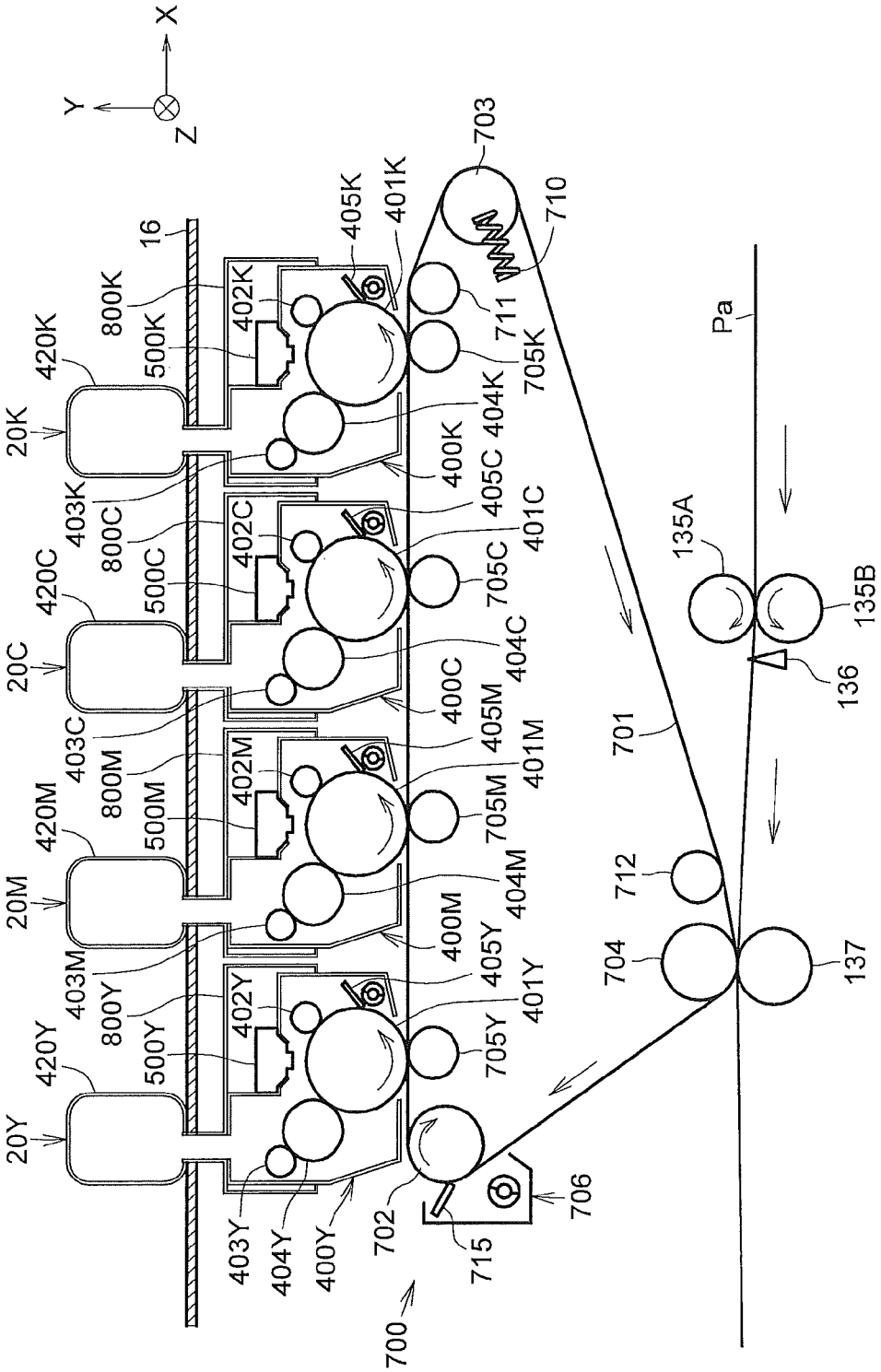
FIG. 2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500M
500Y
402K
402C
402M
402Y
403K
403C
403M
403Y
404K
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404M
404Y
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405C
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401C
401M
401Y
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701
704
712
137
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135B
136
Pa

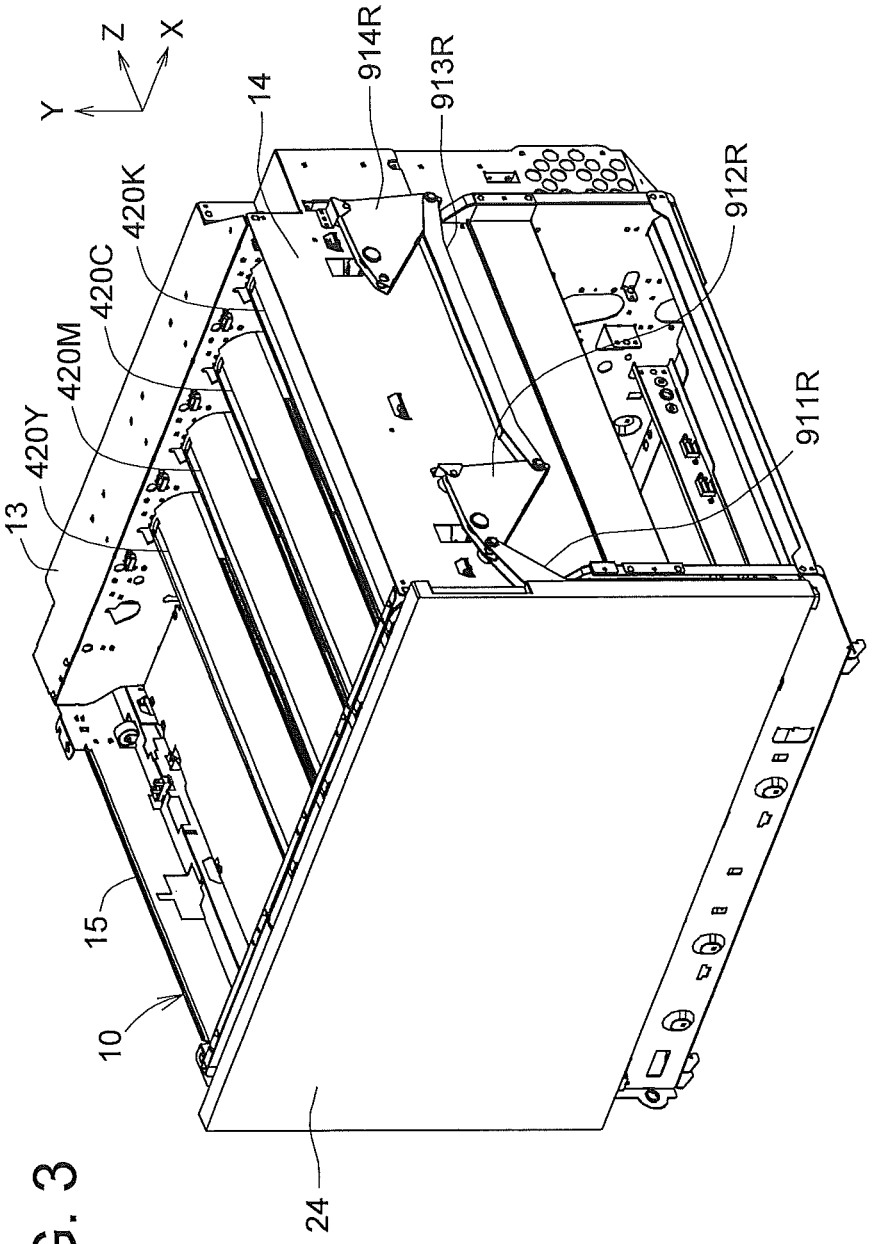
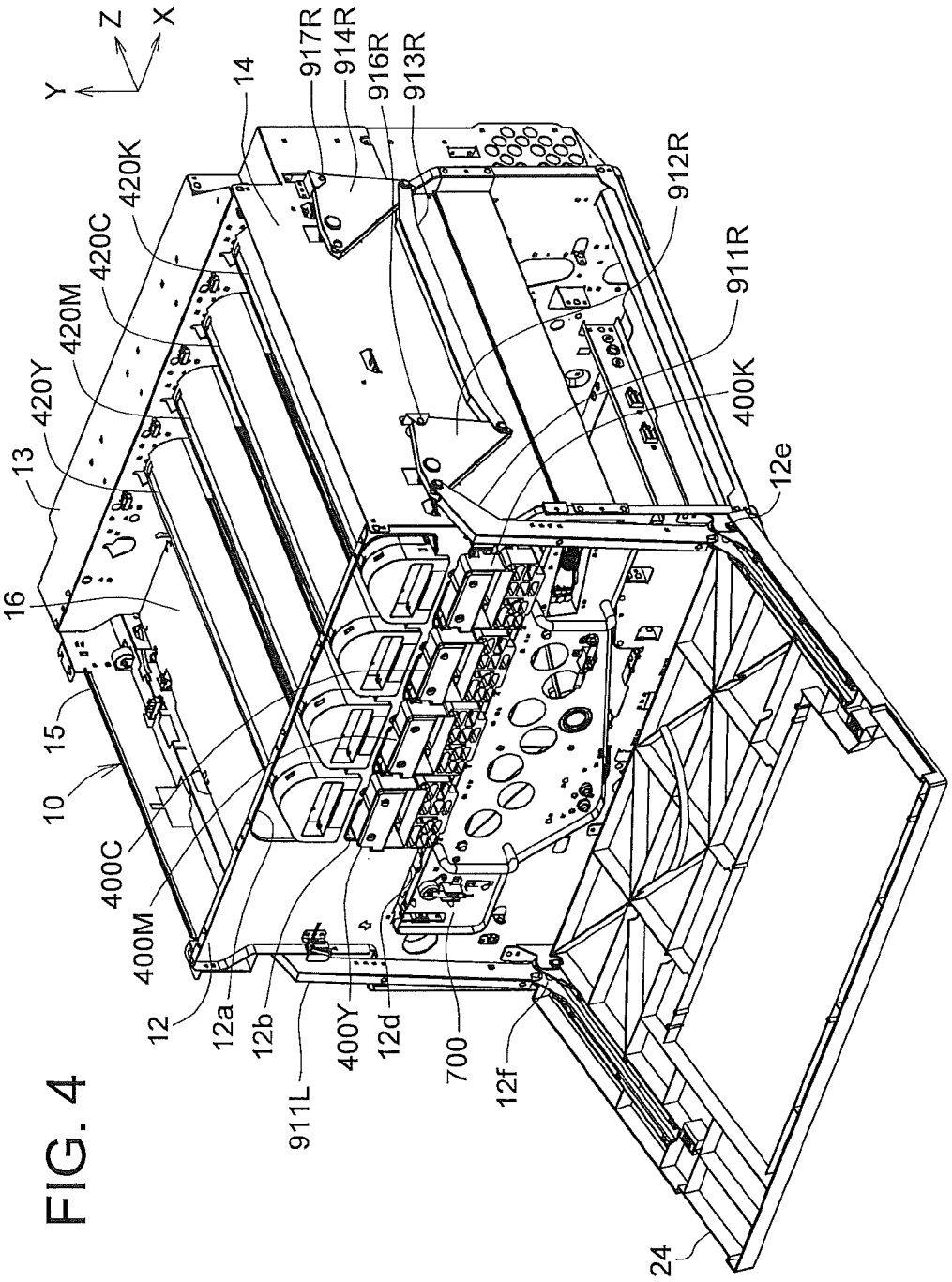



FIG. 3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914R
916R
913R
912R
911R
400K
12e
420K
420C
420M
420Y
13
16
15
10
400C
400M
12
12a
12b
911L
400Y
12d
700
12f
24

FIG. 4

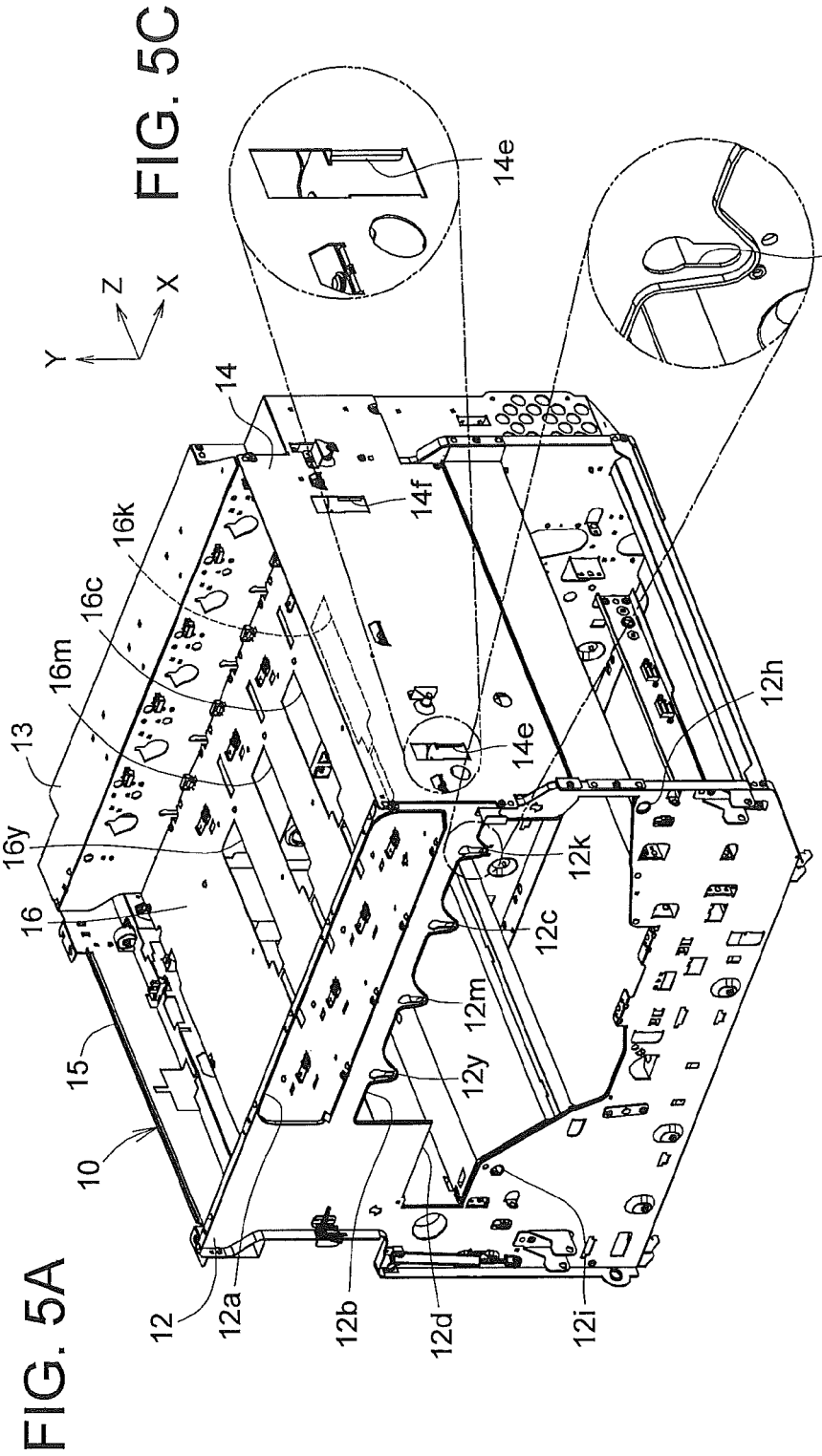
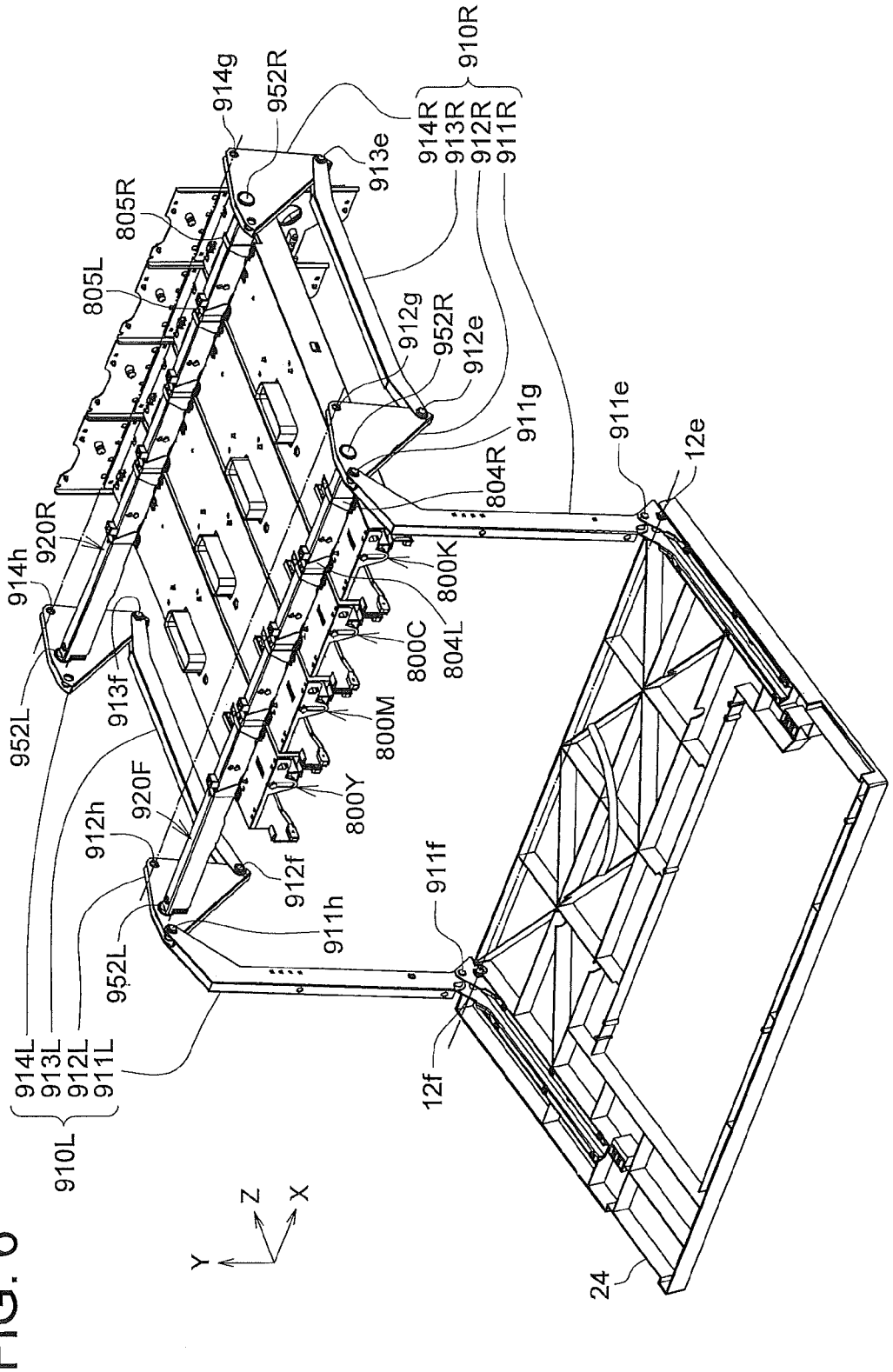



FIG. 5A

FIG. 5B

FIG. 5C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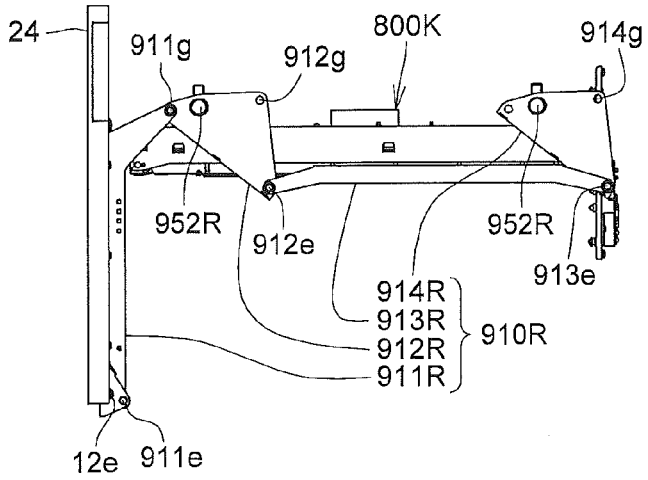
952R
910R
914R
913R
912R
911R
913e
805R
805L
912g
952R
912e
911g
911e
12e
804R
914h
920R
800K
804L
800C
913f
952L
800M
800Y
920F
912h
912f
911h
911f
952L
914L
913L
912L
911L
910L
12f
24
Z
X
Y

FIG. 6

FIG. 7A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912g
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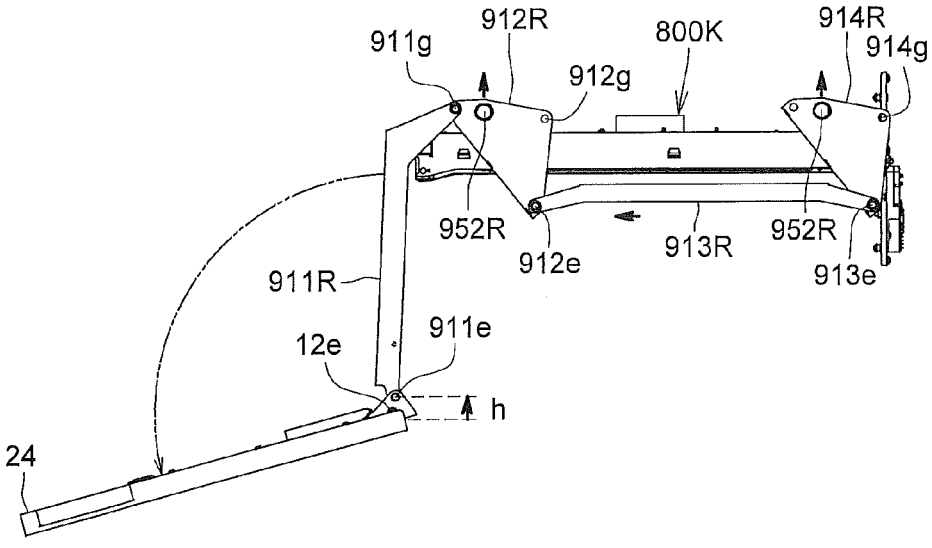
914g
952R
912e
952R
913e
914R
913R
912R
911R
910R
12e
911e

FIG. 7B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912R
912g
800K
914R
914g
952R
912e
913R
952R
913e
911R
12e
911e
h
24

FIG. 8

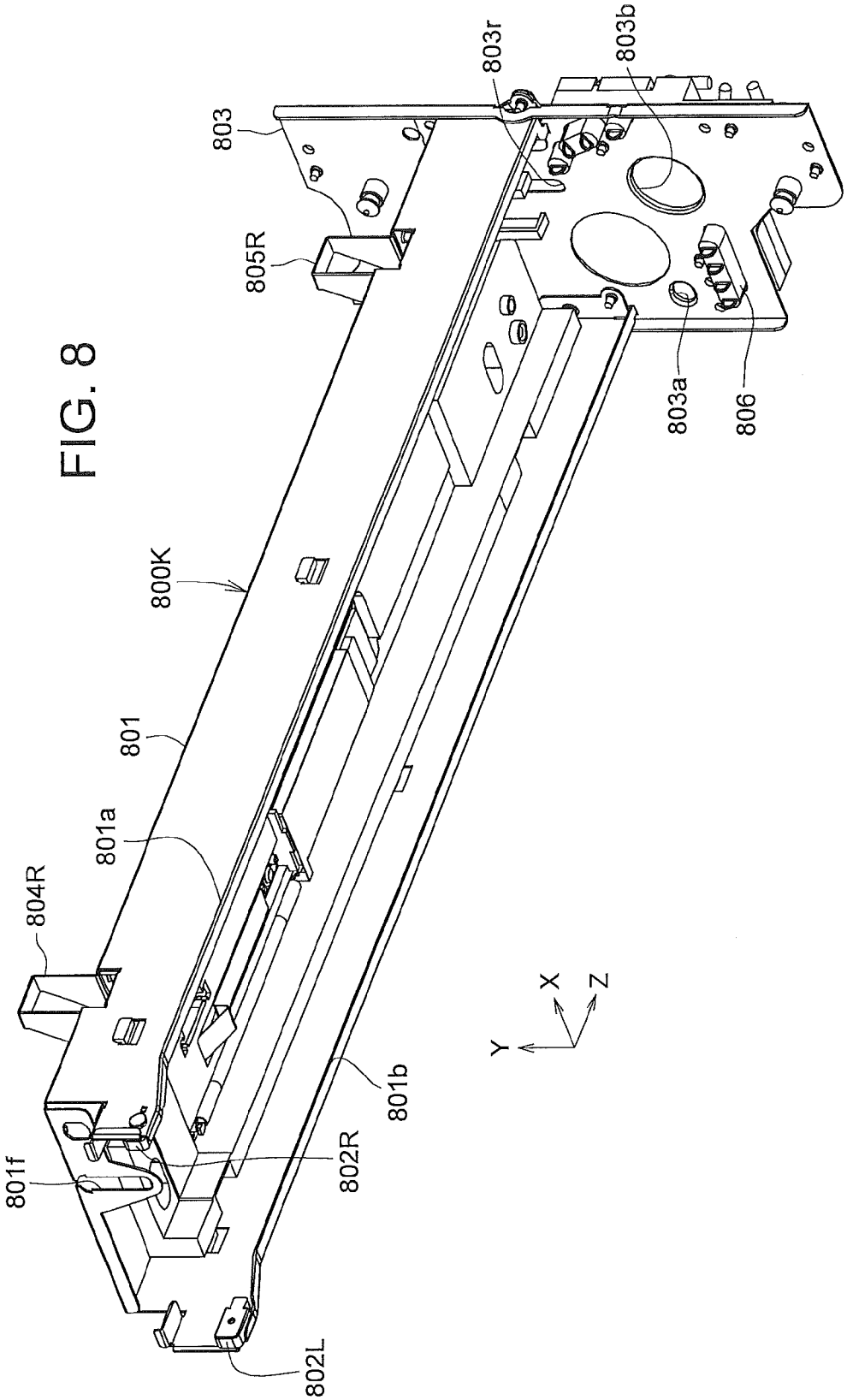

803r
803b
803
805R
803a
806
800K
801
801a
804R
801b
801f
802R
802L
X
Z
Y

FIG. 9

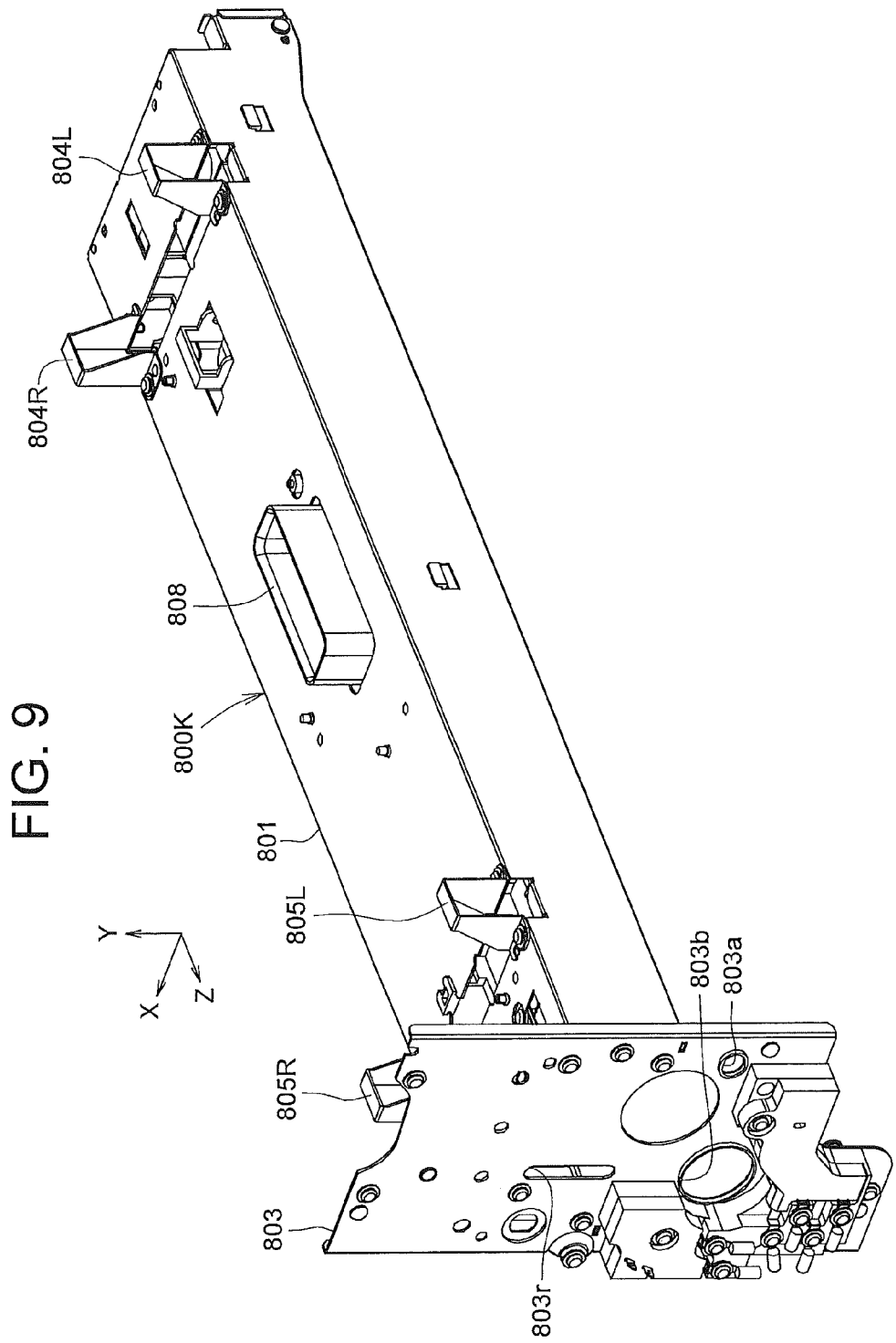


FIG. 10

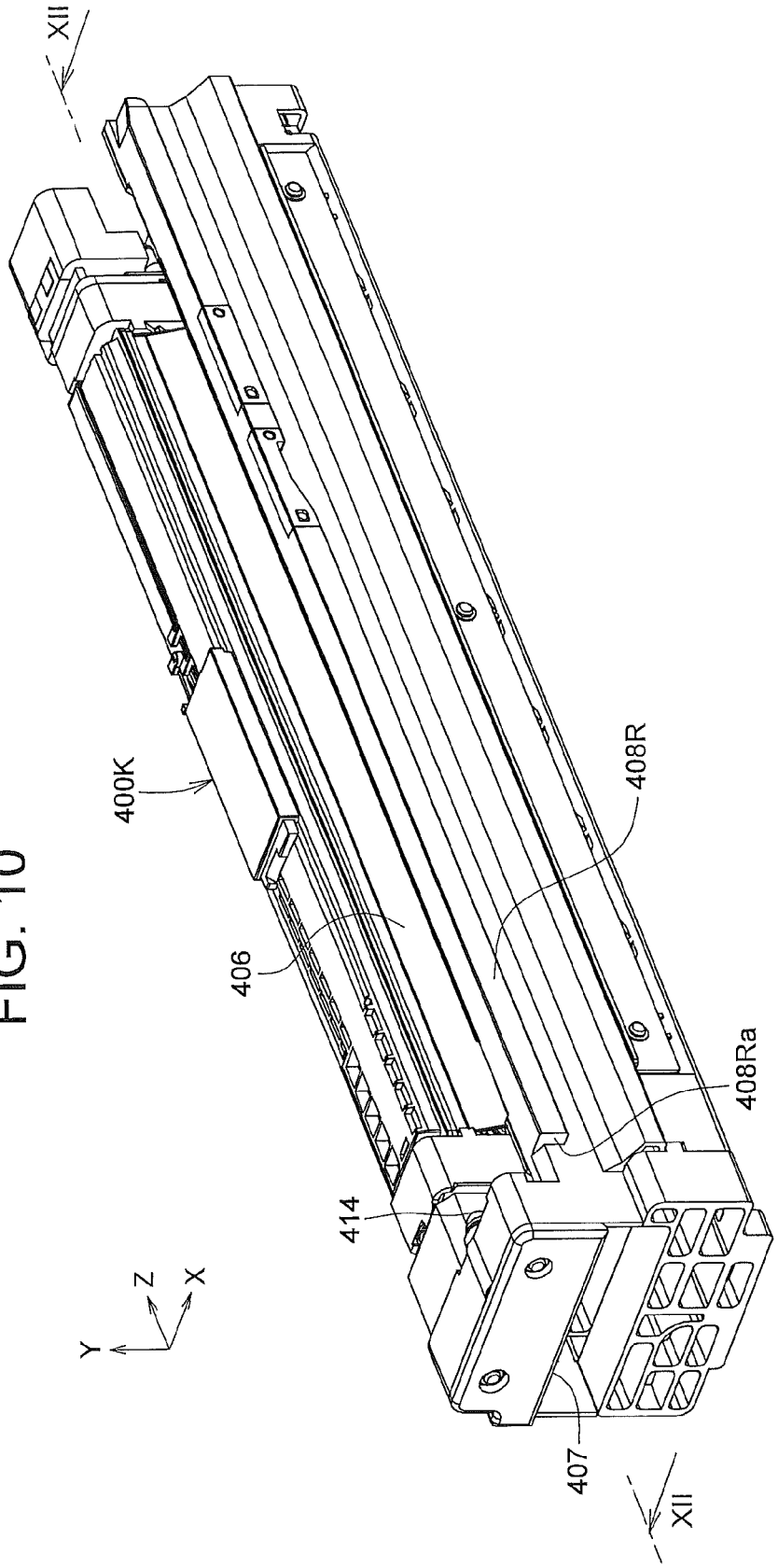


FIG. 11

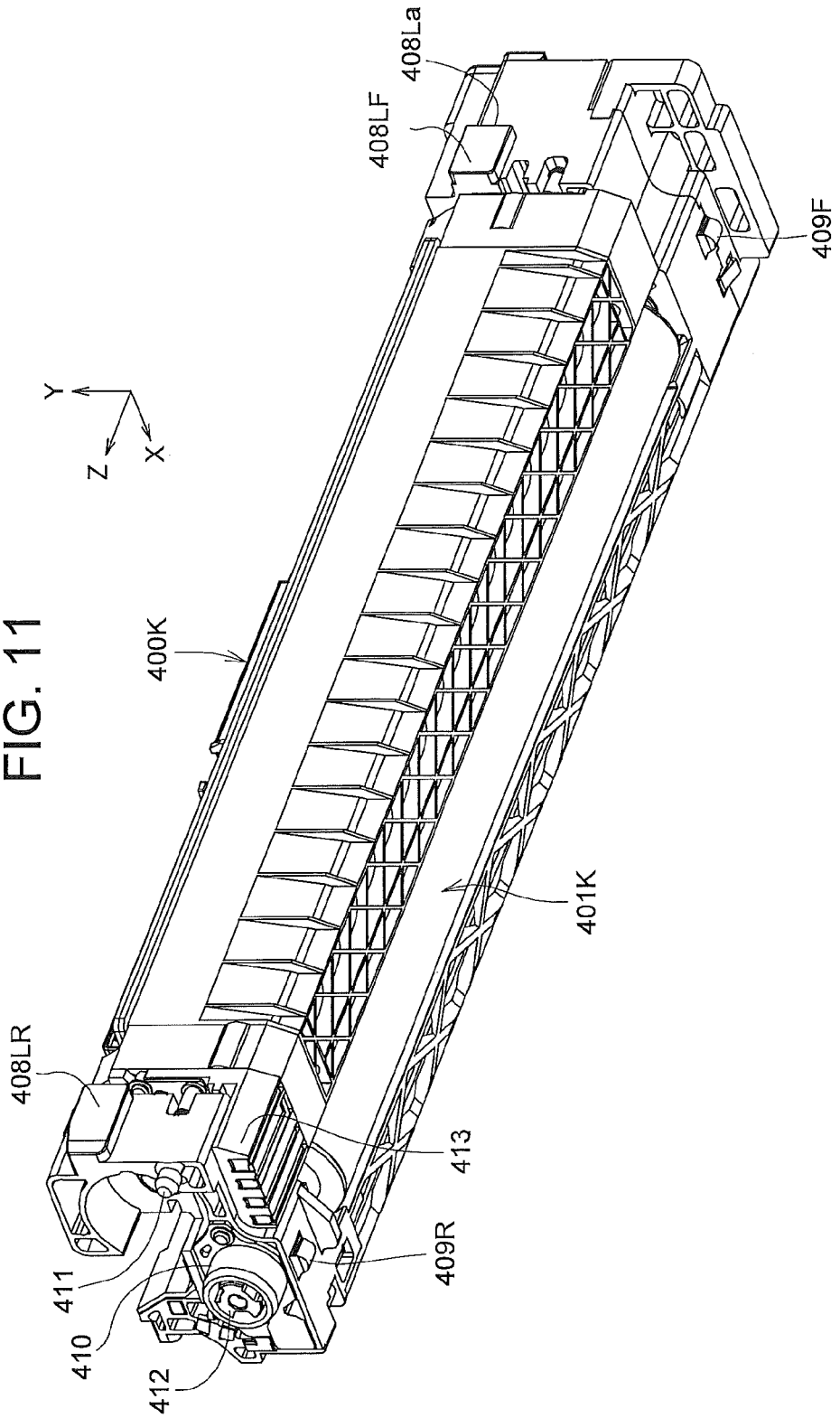
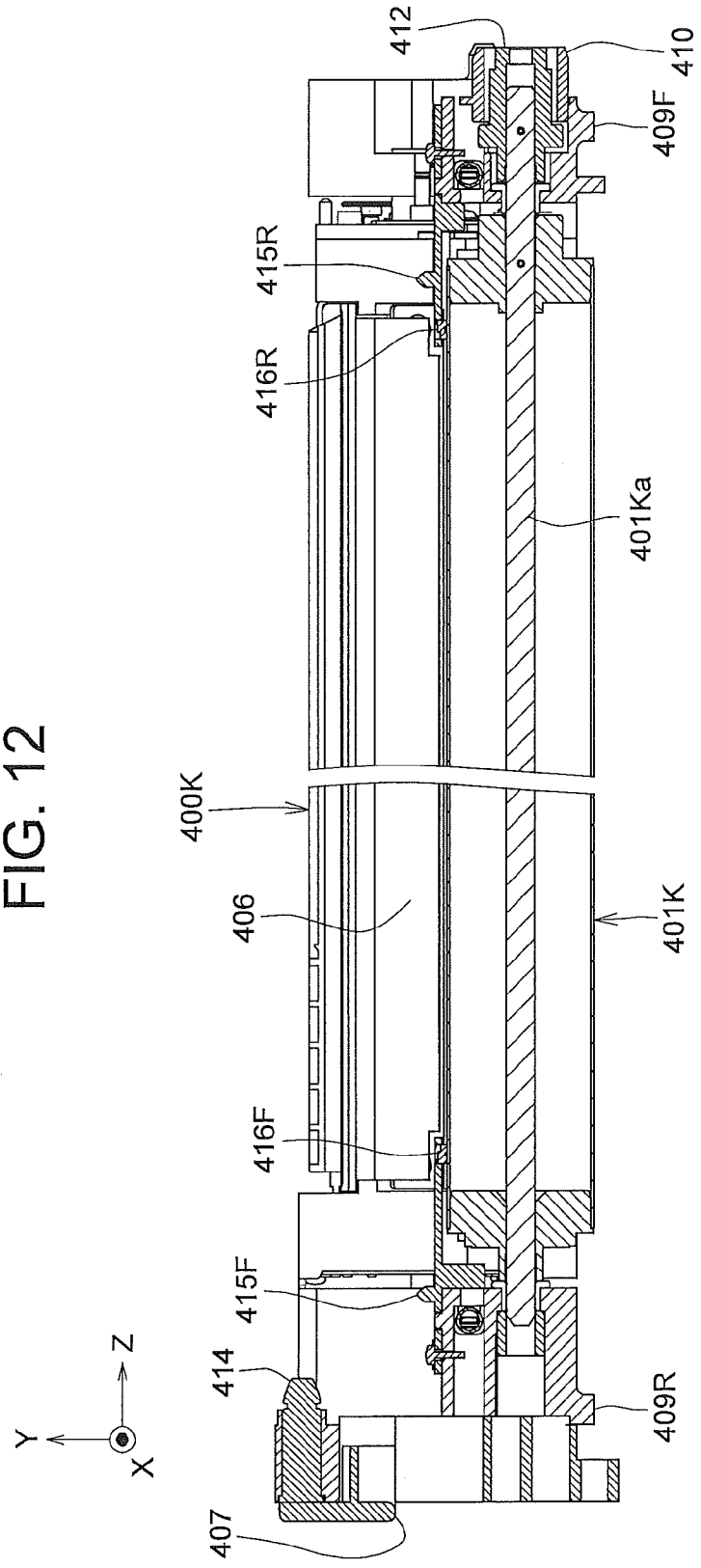


FIG. 12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401K
416F
415F
414
409R
407
Z
Y
X

FIG. 13

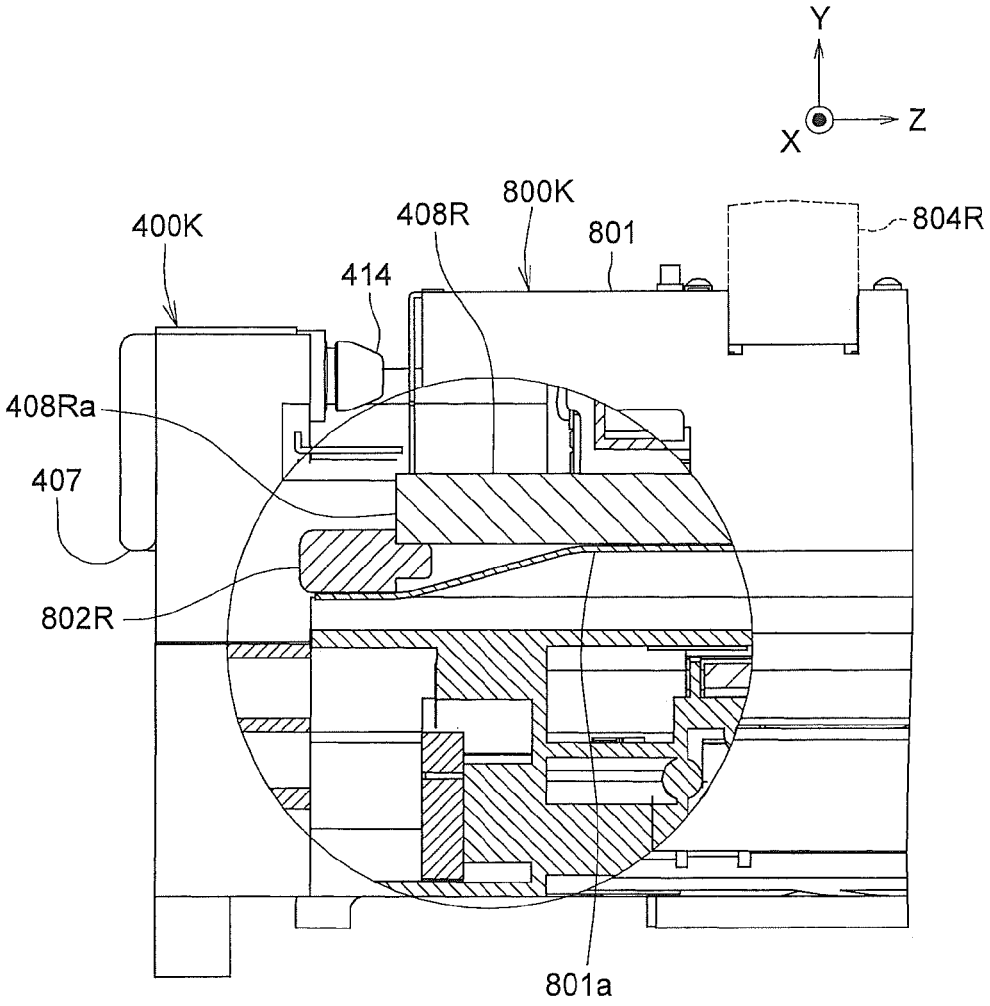
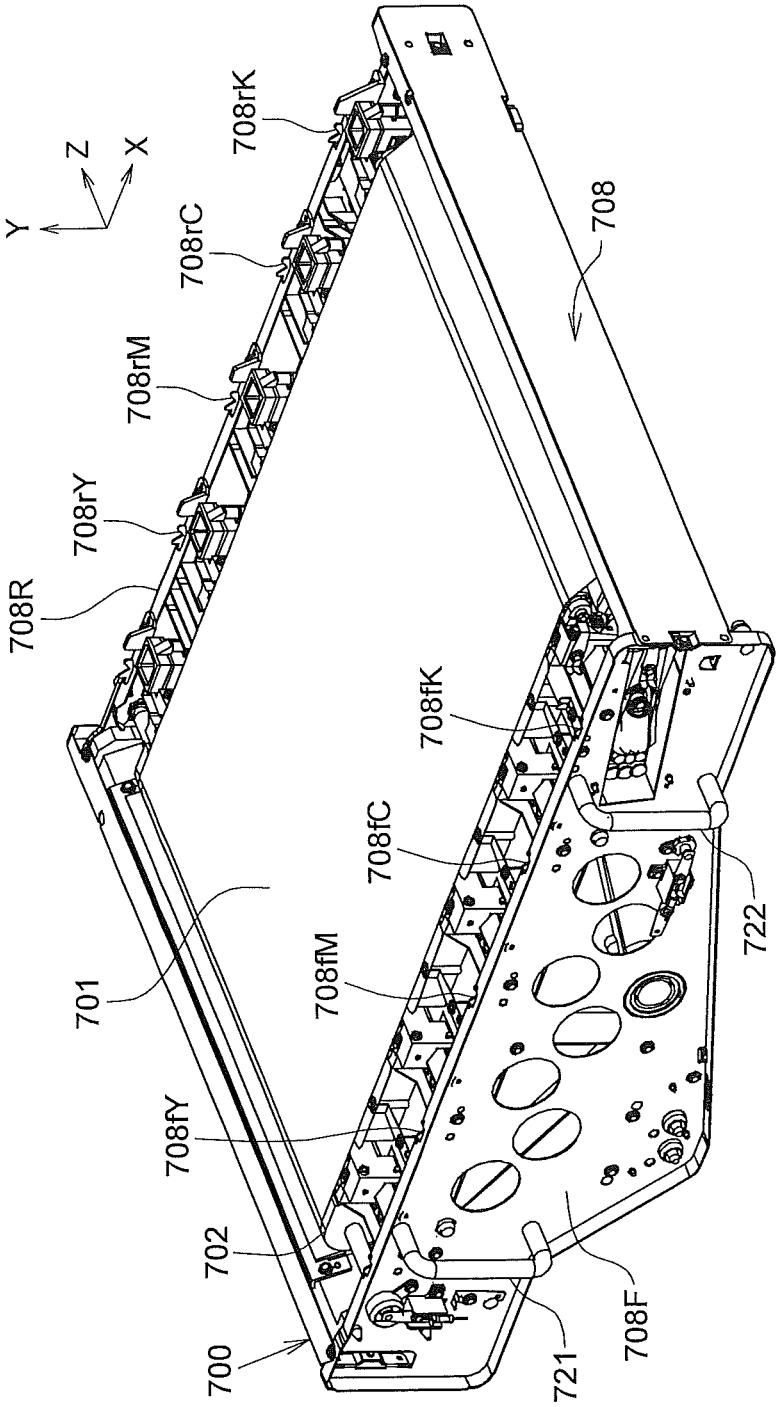


FIG. 14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708rC
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708fK
708fC
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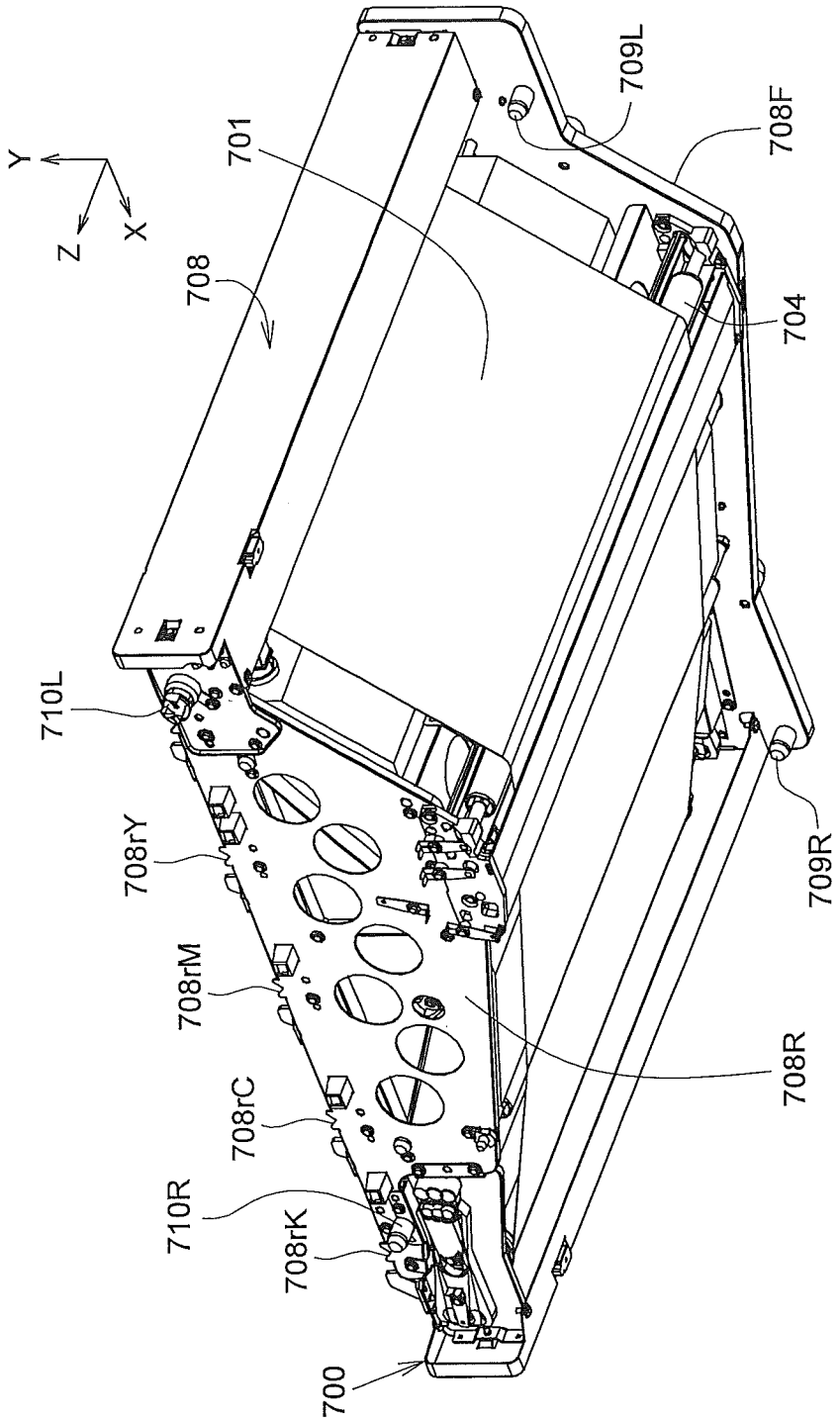
701
708fM
708fY
702
700
721
708F

FIG. 15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X
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704
710L
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708rM
708rC
710R
708rK
700
709R
708R

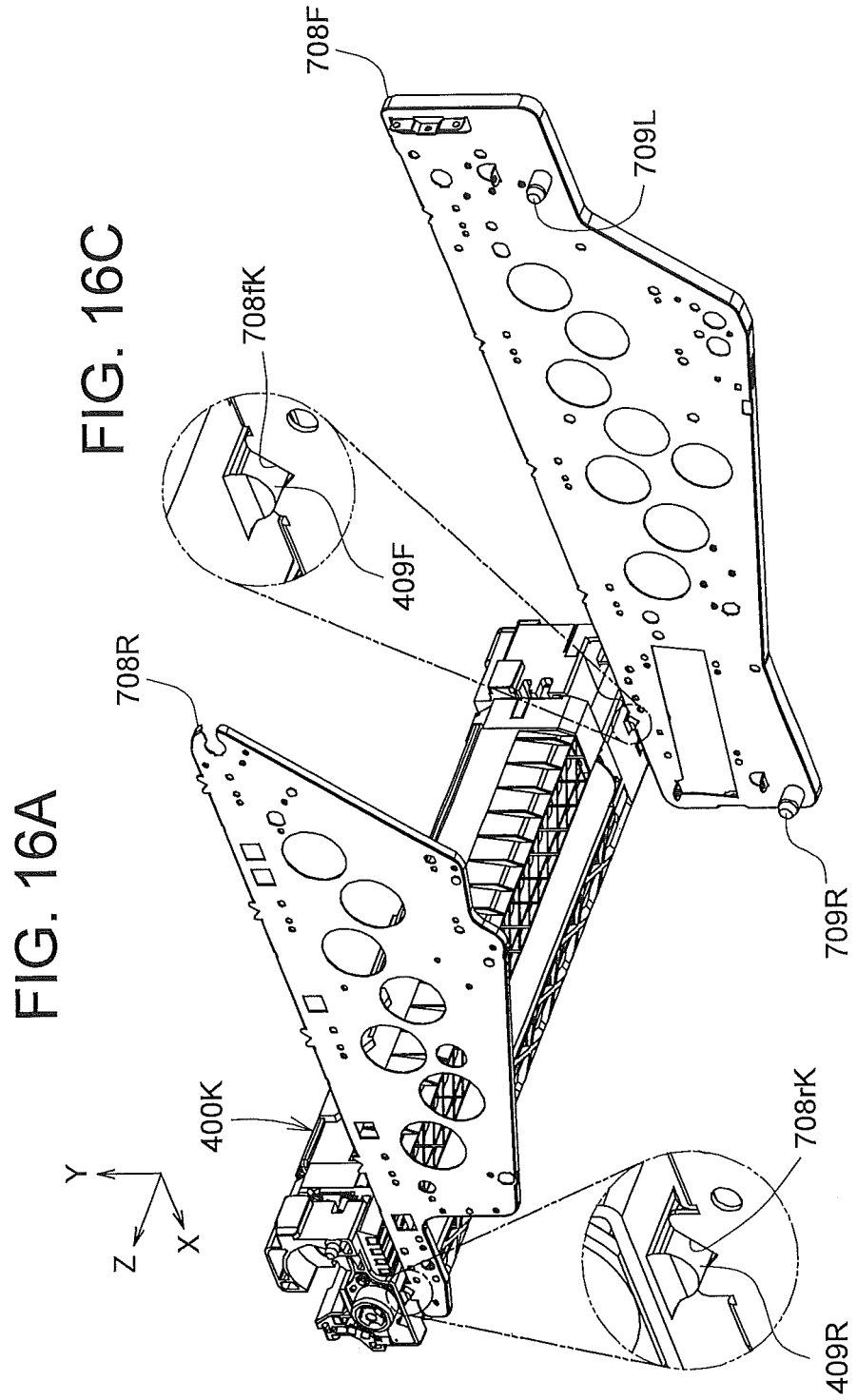
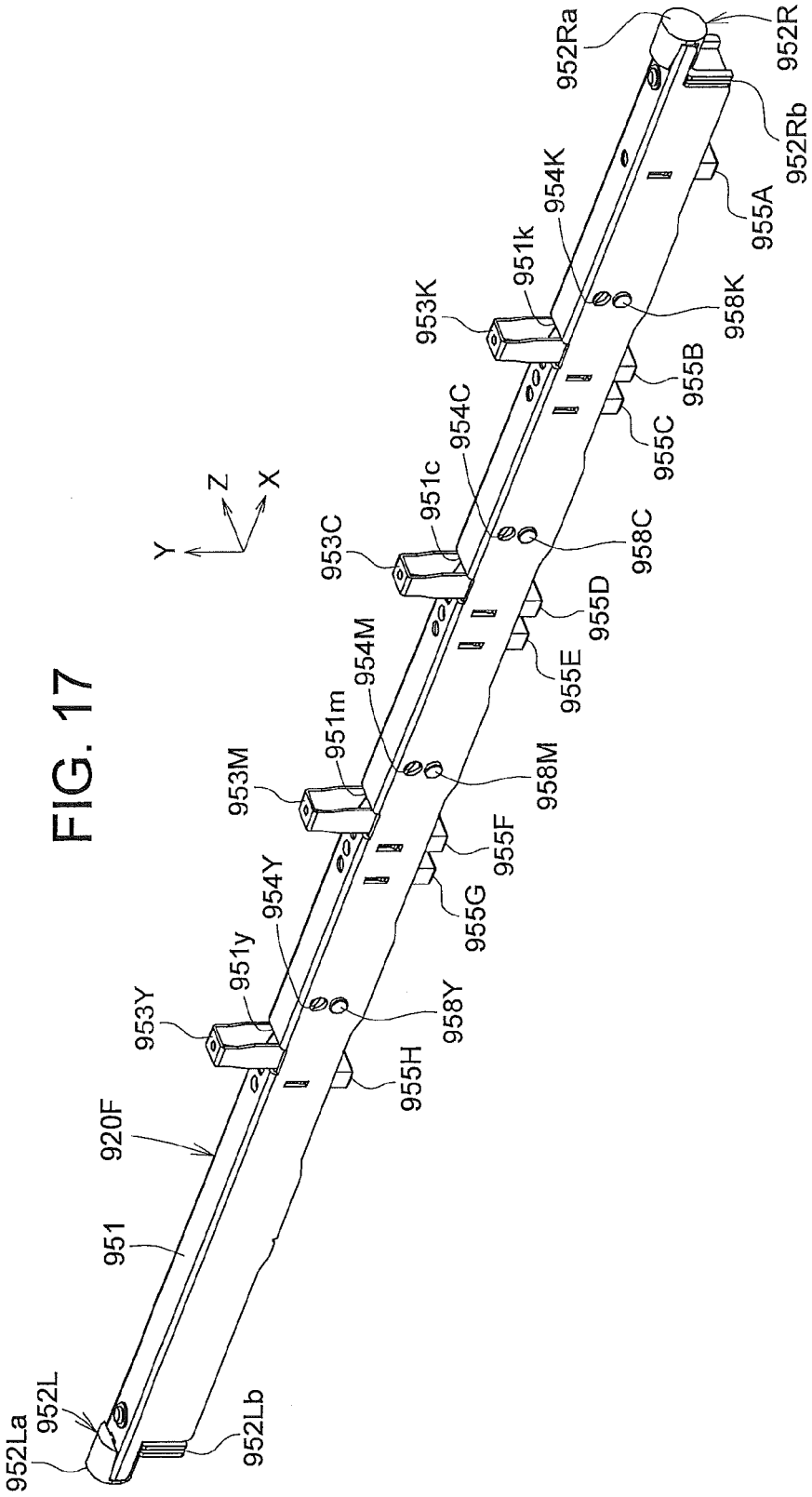



FIG. 16A

FIG. 16C

FIG. 16B

FIG. 17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958K
955B
955C
954C
951c
953C
958C
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954M
951m
953M
958M
955F
955G
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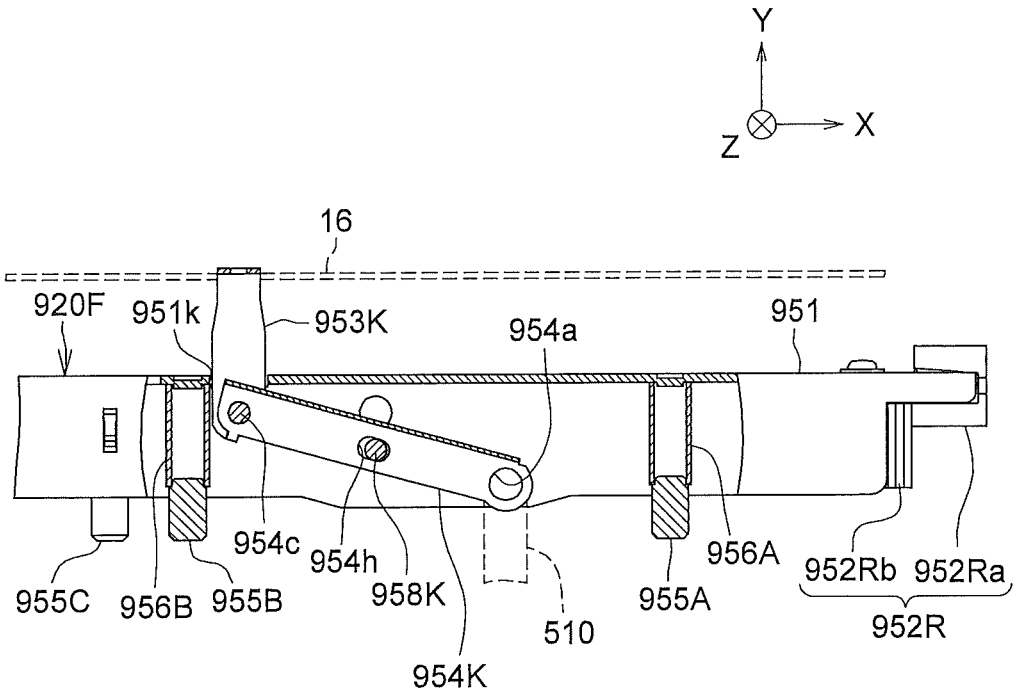
953Y
958Y
955H
920F
951
952L
952La
952Lb
Z
X
Y

FIG. 18


Y
X
Z
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920F
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953K
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955C
956B
955B
958K
955A
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952R
954K

FIG. 19

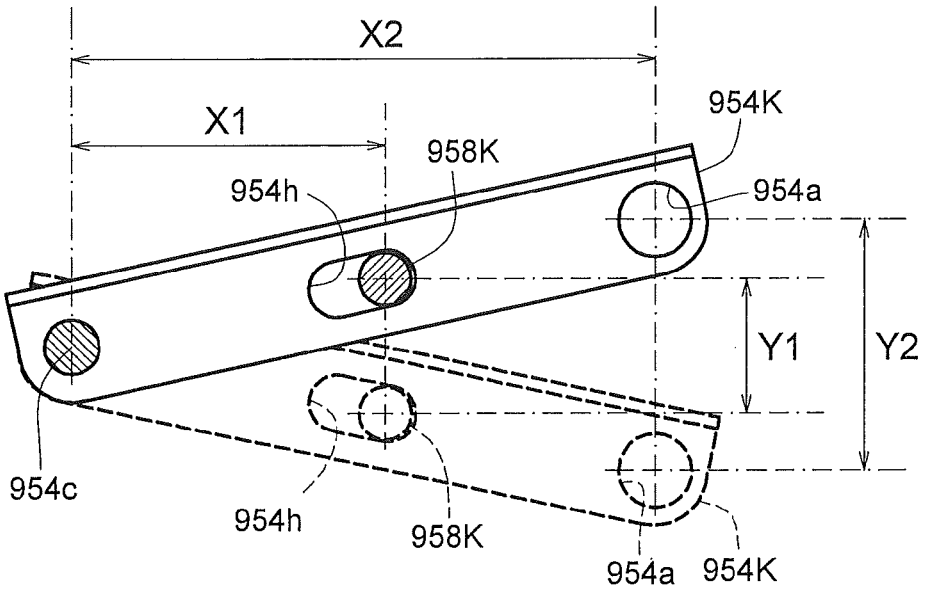
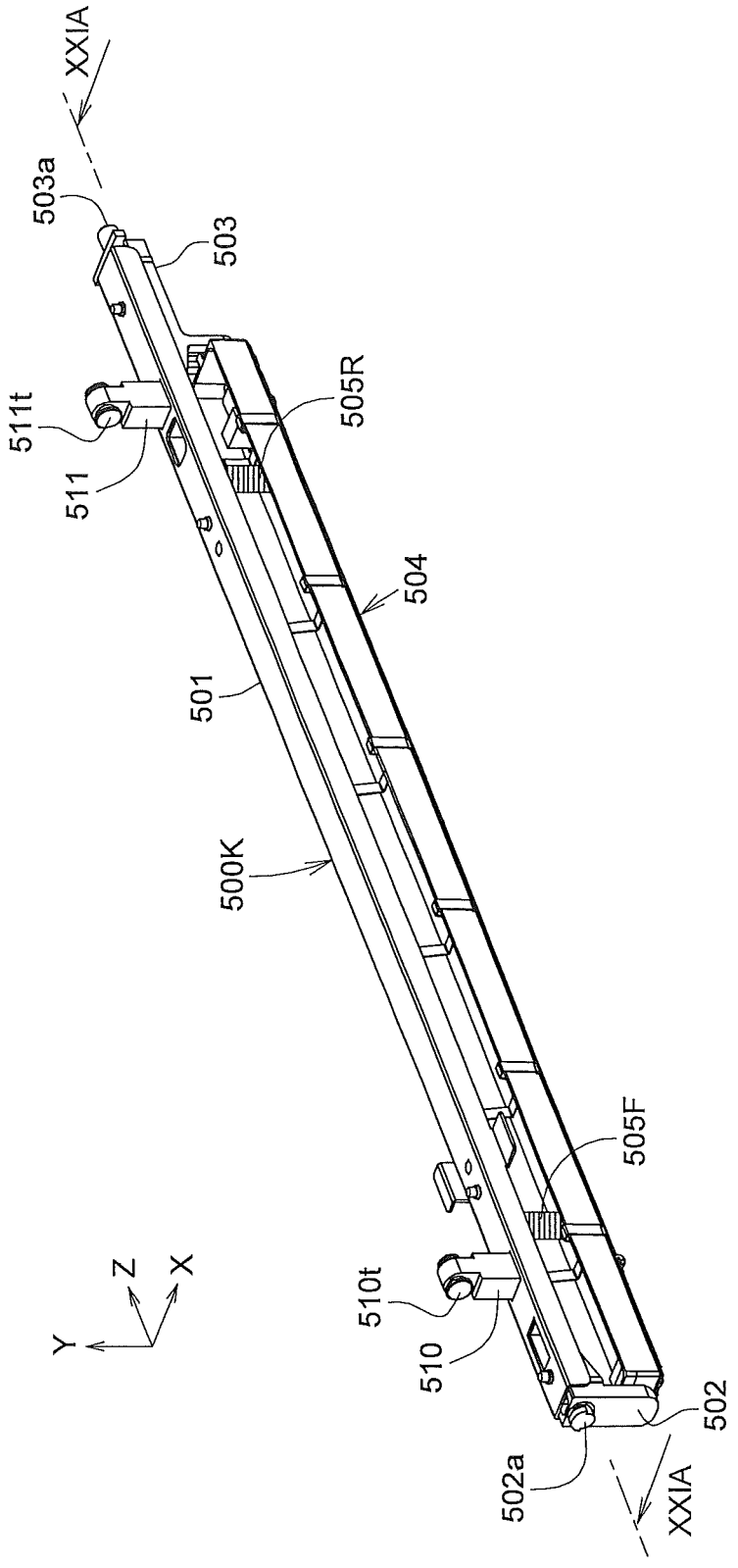


FIG. 20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500K
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502a
XXIA
Z
X
Y

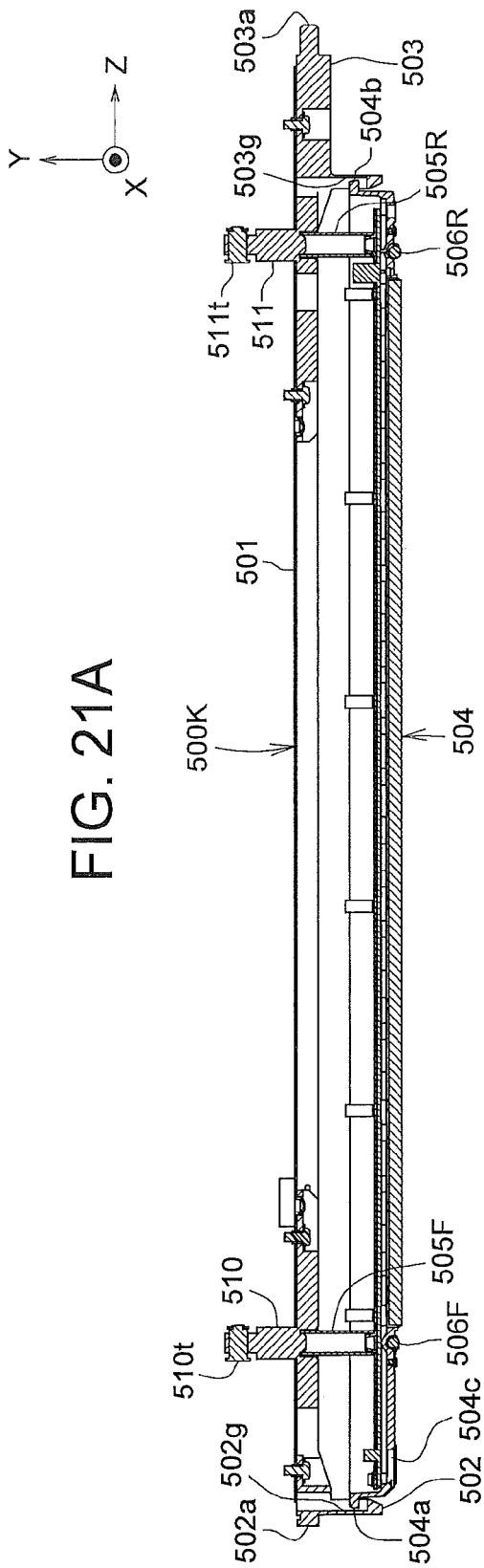



FIG. 21A

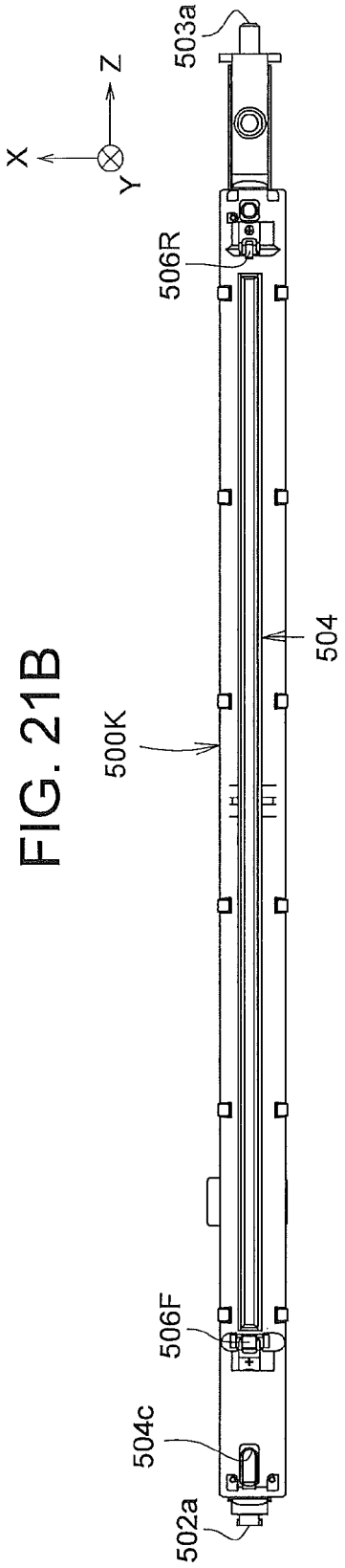
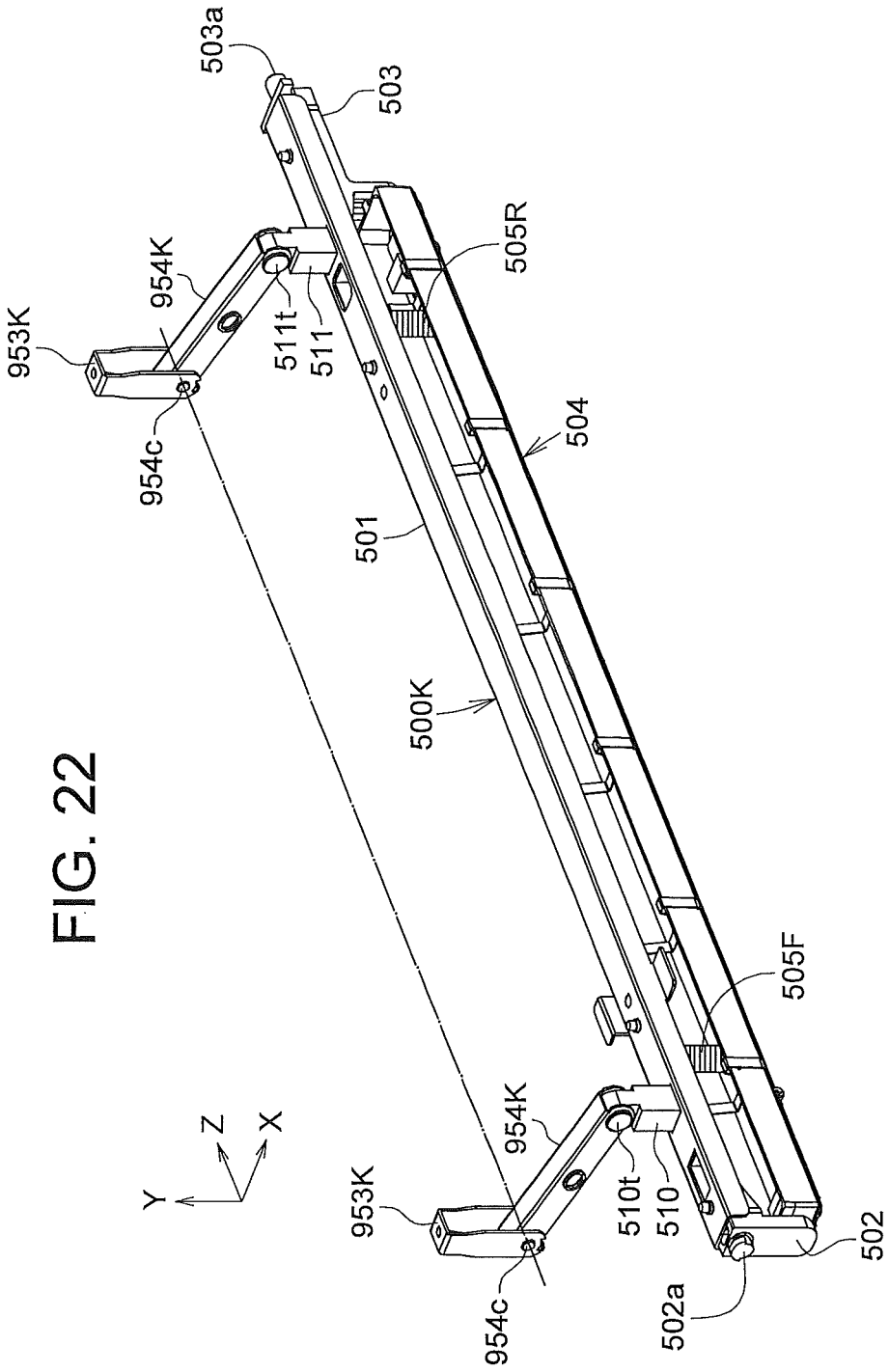



FIG. 21B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503
505R
954K
953K
511t
511
504
954c
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500K
505F
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X
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954K
953K
510t
510
502
954c
502a

FIG. 22

FIG. 23B

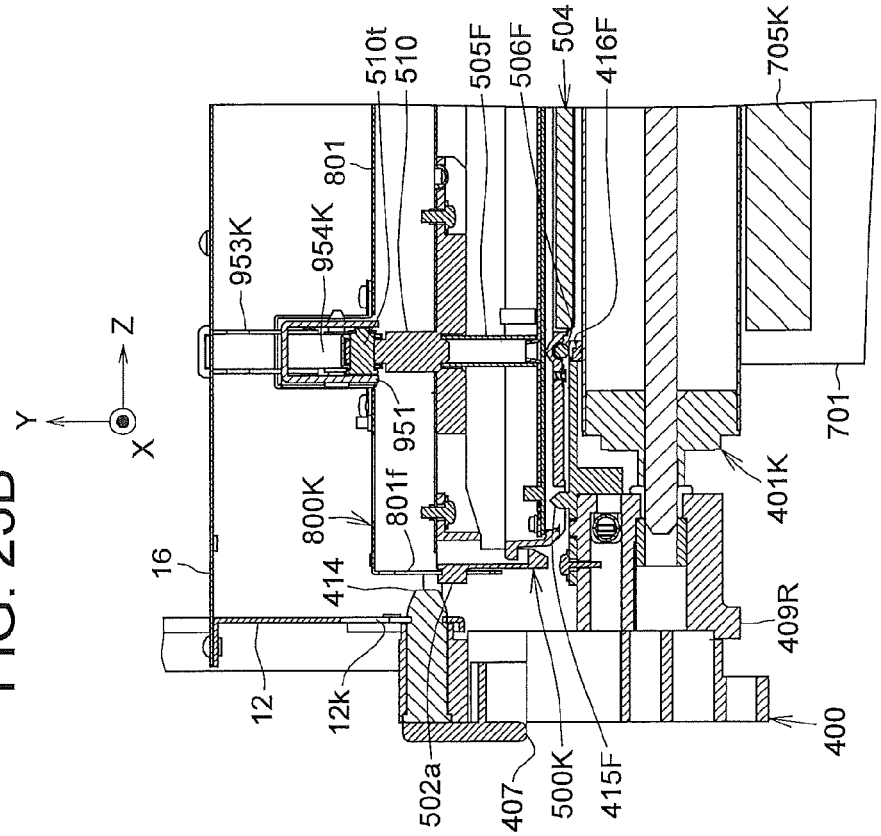



FIG. 23A

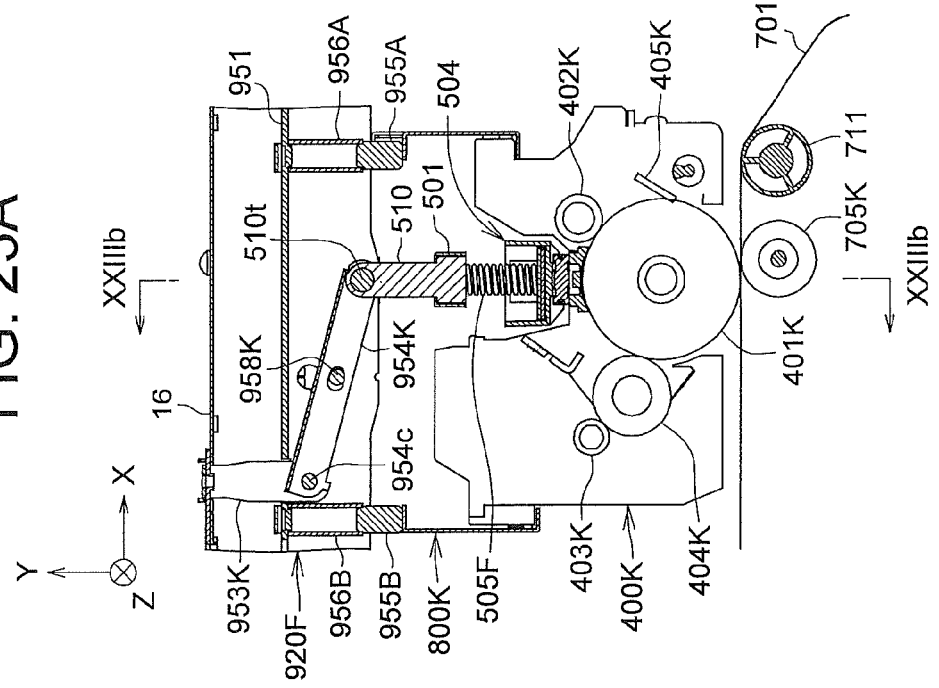


FIG. 24A

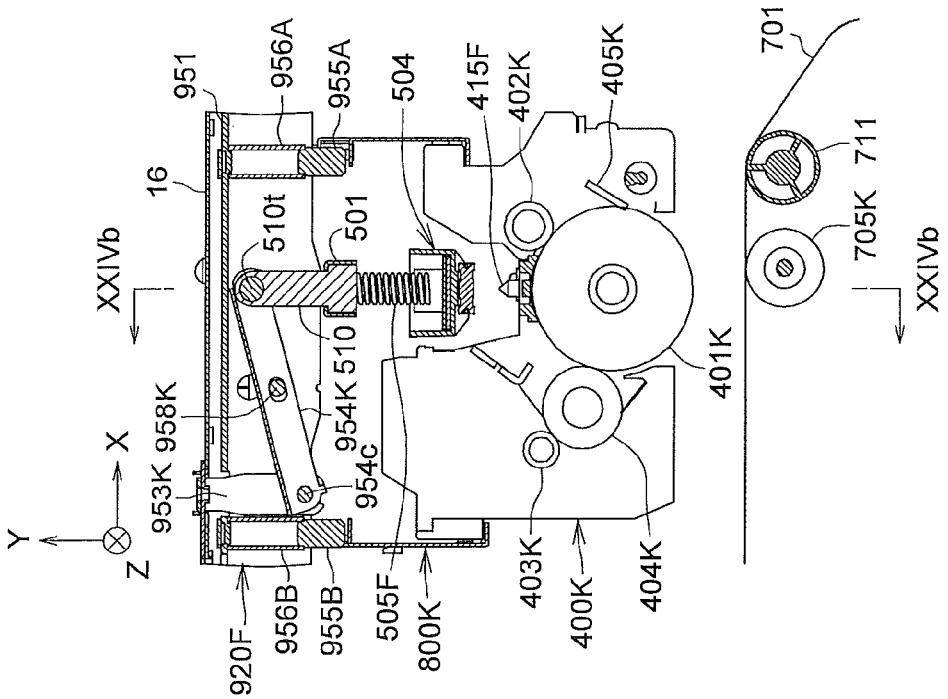



FIG. 24B

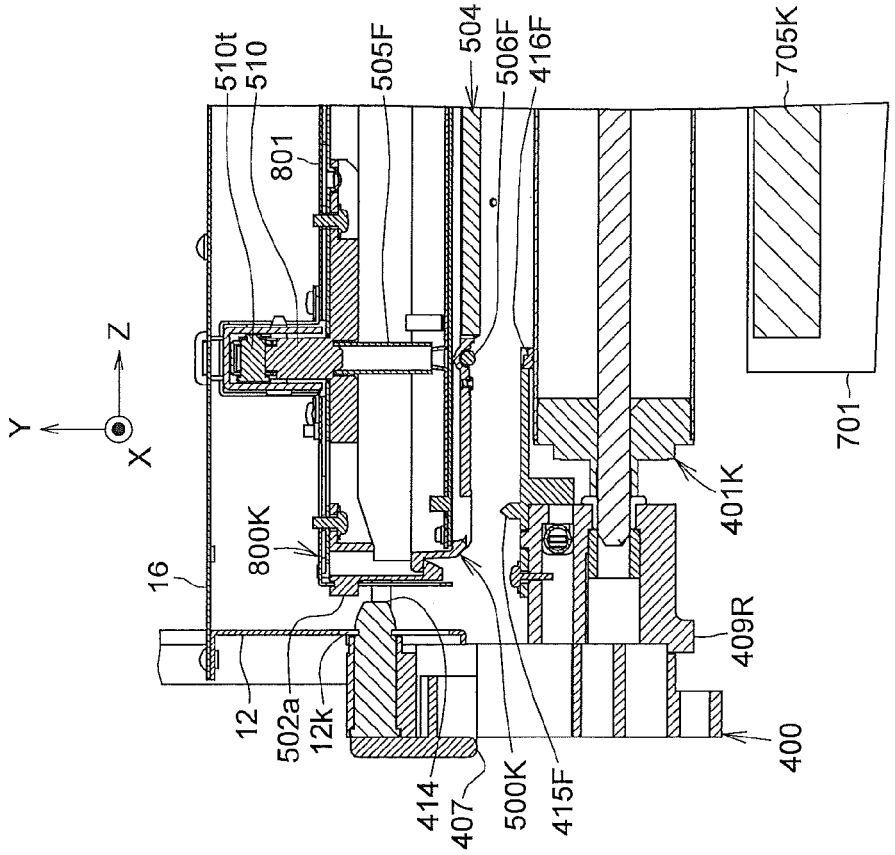


FIG. 25

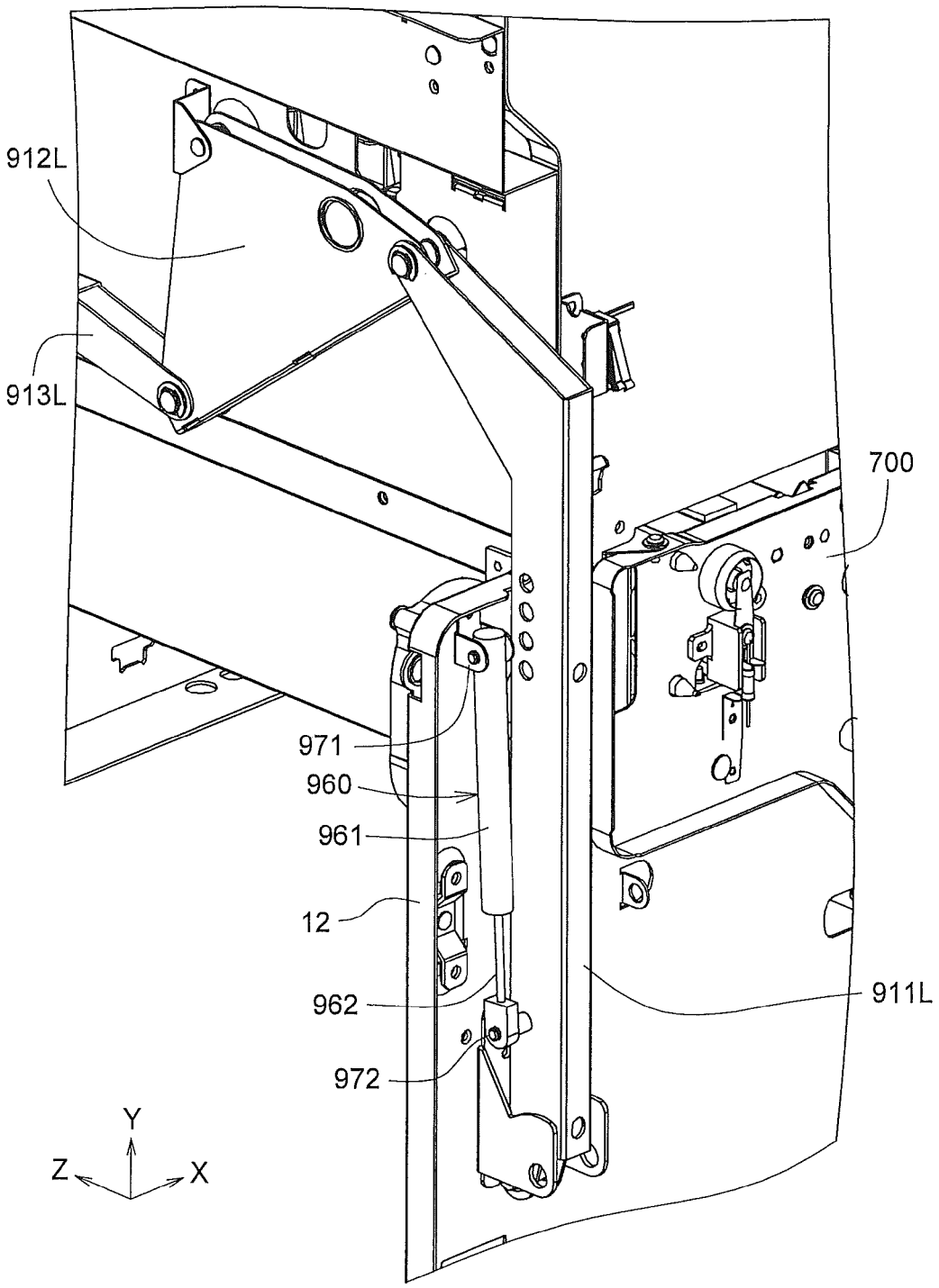


FIG. 26B

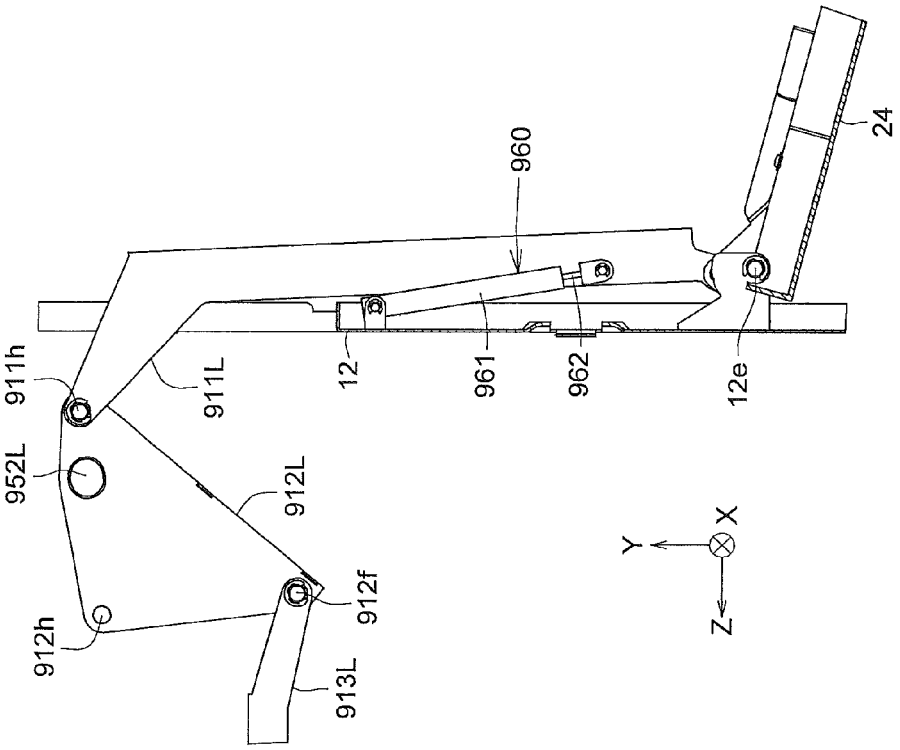



FIG. 26A

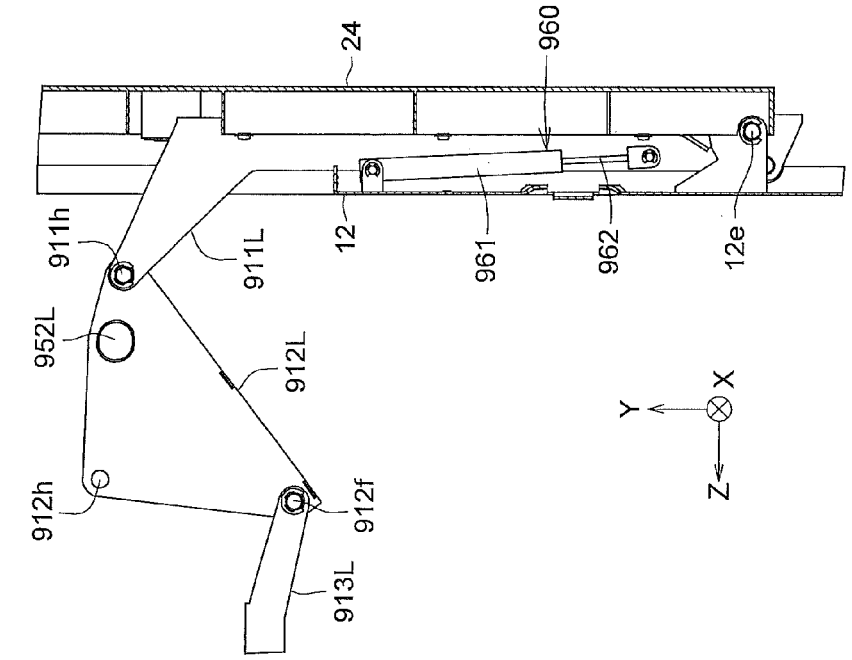
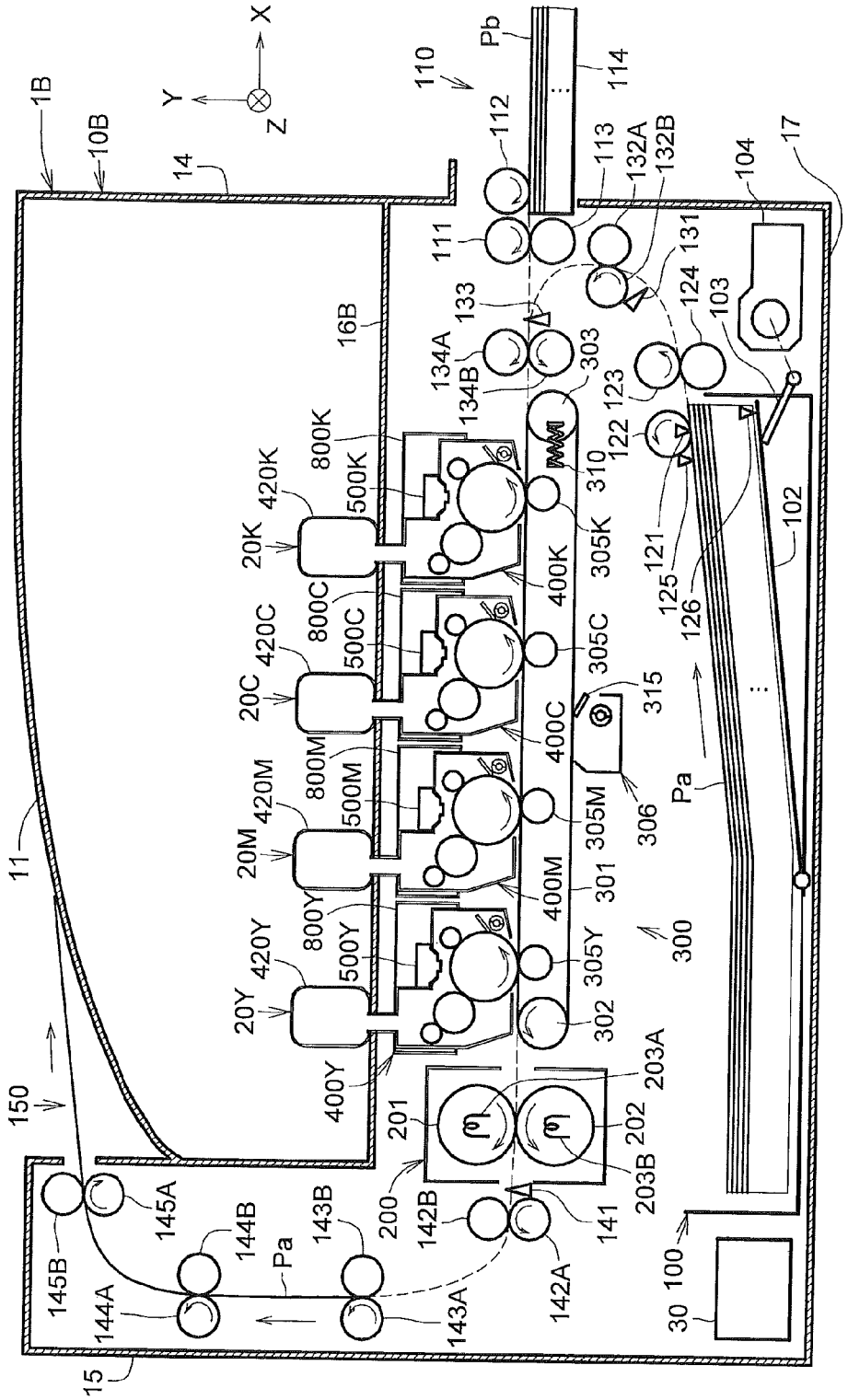


FIG. 27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134A
134B
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16B
800K
500K
420K
20K
400K
305K
121
125
126
102
800C
500C
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145A
145B
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144A
143B
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142B
142A
141
200
Pa
30
100
15

# IMAGE FORMING APPARATUS

## BACKGROUND OF THE INVENTION

The present invention relates to an image forming apparatus using electrophotographic technology.

Image forming apparatuses such as a copier, a facsimile machine or a printer using electrophotographic technology are widely used. Such an image forming apparatus performs a charging process to uniformly charge a surface of an image bearing body such as a photosensitive drum, an exposure process to expose the surface of the image bearing body with light to form a latent image, a developing process to develop the latent image using a developer to form a developer image on the image bearing body, a transfer process to transfer the developer image to a medium such as a paper, and a fixing process to fix the developer image to the medium.

Recently, there has been developed an image forming apparatus including a process unit and an apparatus main body to which the process unit is detachably mounted. The process unit includes several units for performing the above described processes (for example, the image bearing body, a charging unit that performs the charging process, and a developing unit that performs the developing process). The process unit can be easily detached or replaced, for example, when operation failure of the image forming apparatus occurs or when maintenance of the image forming apparatus is to be performed. An example of such an image forming apparatus is disclosed in, for example, Japanese Laid-open Patent Publication No. 2006-78542 (see FIG. **3** and paragraphs 0014-0016).

The image forming apparatus disclosed in the above described publication includes an apparatus main body, a process unit (i.e., a process cartridge) detachably mounted to the apparatus main body, a cover member rotatably provided on the apparatus main body, and an optical head mounted on an inner side of the cover member. When the cover member is in a position to close an upper part of the apparatus main body, a light emitting surface of the optical head faces a surface of a photosensitive drum (i.e., the image bearing body) provided in the process unit. When detaching the process unit from the apparatus main body, the cover member is rotated so as to open the upper part of the apparatus main body, and then the process unit is taken out from the apparatus main body. In other words, the process unit is configured as a replaceable unit.

However, in the conventional image forming apparatus, operability in detaching or replacing the replaceable unit (i.e., the process unit) is not sufficient.

## SUMMARY OF THE INVENTION

An aspect of the present invention is intended to provide an image forming apparatus capable of enhancing operability in detaching or replacing a replaceable unit.

According to an aspect of the present invention, there is provided an image forming apparatus including an apparatus main body, and a visible image forming unit that forms a developer image. The visible image forming unit includes a first unit, a second unit detachably mounted to the apparatus main body, and a third unit. The image forming apparatus further includes a first mechanism that causes the first unit and the second unit to move closer to or away from each other, a moving member that moves the first mechanism, and a second mechanism that causes the second unit and the third unit to move closer to or away from each other in synchronization with a movement of the first mechanism.



With such a configuration, operability in detaching or replacing a replaceable unit can be enhanced.

Further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific embodiments, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

## BRIEF DESCRIPTION OF THE DRAWINGS

In the attached drawings:

FIG. **1** is a schematic view showing a configuration of an image forming apparatus according to the first embodiment of the present invention;

FIG. **2** is a schematic view showing a configuration of an image forming unit and an intermediate transfer belt unit according to the first embodiment;

FIG. **3** is a perspective view showing the image forming apparatus in a state where a front cover portion is in a closing position;

FIG. **4** is a perspective view showing the image forming apparatus in a state where the front cover portion is in an opening position;

FIG. **5**A is a perspective view showing a main body (i.e., a frame) of the image forming apparatus according to the first embodiment;

FIGS. **5**B and **5**C are enlarged views showing parts of the image forming apparatus according to the first embodiment;

FIG. **6** is a perspective view showing an example of a linking mechanism for linking a unit holding portion and the front cover portion;

FIG. **7**A is a right-side view showing the linking mechanism in a state where the front cover portion is in the closing position;

FIG. **7**B is a right-side view showing the linking mechanism in a state where the front cover portion is in the opening position;

FIG. **8** is a bottom front perspective view showing an external configuration of the unit holding portion;

FIG. **9** is a top rear perspective view showing the external configuration of the unit holding portion;

FIG. **10** is a top front perspective view showing the process unit;

FIG. **11** is a bottom rear perspective view showing the process unit;

FIG. **12** is a longitudinal sectional view showing the process unit;

FIG. **13** is a sectional view showing a part of the process unit mounted to the unit holding portion;

FIG. **14** is a top front perspective view showing the intermediate transfer belt unit;

FIG. **15** is a bottom rear perspective view showing the intermediate transfer belt unit;

FIG. **16**A is a perspective view showing a relationship between the intermediate transfer belt unit and the process unit;

FIGS. **16**B and **16**C are enlarged views showing engaging portions between the intermediate transfer belt unit and the process unit;

FIG. **17** is a perspective view showing an external configuration of a beam unit according to the first embodiment;

FIG. **18** is a schematic sectional view showing a configuration of one of linking mechanisms for linking the unit holder potion and an exposure unit;

FIG. **19** is a schematic view showing a linking lever member that moves in association with a beam member;

FIG. **20** is a perspective view showing the exposure unit according to the first embodiment;

FIGS. **21**A and **21**B are a longitudinal sectional view and a bottom view of the exposure unit shown in FIG. **20**;

FIG. **22** is a perspective view showing an external configuration of the exposure unit according to the first embodiment;

FIGS. **23**A and **23**B are sectional views showing the linking mechanism of the beam unit in a state where the cover member is in the closing position shown in FIG. **7**A;

FIGS. **24**A and **24**B are sectional views showing the linking mechanism of the beam unit in a state where the cover member is in the opening position shown in FIG. **7**B;

FIG. **25** is a perspective view showing a cushion mechanism provided between an arm member and an apparatus main body;

FIG. **26**A is a schematic view showing the cushion mechanism in a state where the cover member is in the closing position;

FIG. **26**B is a schematic view showing the cushion mechanism in a state where the cover member is in the opening position; and

FIG. **27** is a schematic view showing a configuration of an image forming apparatus of a direct transfer type.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Hereinafter, embodiments of the present invention will be described with reference to drawings. The drawings are provided for illustrative purpose and are not intended to limit the scope of the present invention. In the drawings, identical components are assigned with the same reference numerals.

### First Embodiment

FIG. **1** is a schematic view showing a configuration of an image forming apparatus **1** according to the first embodiment of the present invention. The image forming apparatus **1** uses electrophotographic technology, and is configured to transfer a developer image to a recording medium using an intermediate transfer method. The intermediate transfer method is a method forming a developer image on an image bearing body (for example, a photosensitive drum), primarily transferring the developer image to an intermediate transfer belt, and secondarily transferring the developer image to the recording medium.

As shown in FIG. **1**, the image forming apparatus **1** includes an apparatus main body (i.e., a frame) **10**, a tray **100**, an MPT (i.e., a multi-purpose tray) **110**, image forming units **20**K, **20**C, **20**M and **20**Y, an intermediate transfer belt unit **700**, a secondary transfer roller **137** (i.e., a secondary transfer portion), a fixing unit **200**, and a control unit **30**.

The tray **100** is configured to store a stack of recording media Pa in the form of sheets. The MPT **110** is configured to store a stack of recording media Pb in the form of sheets. The image forming units **20**K, **20**C, **20**Y and **20**M are configured to form developer images (i.e., toner images) of different colors. The intermediate transfer belt unit **700** is configured to carry the developer image to the secondary transfer portion. The secondary transfer roller **137** is configured to transfer the developer image from an intermediate transfer belt **701** to the printing medium Pa (Pb). The fixing unit **200** is configured to fix the developer image to the recording medium Pa (Pb). The control unit **30** controls an entire operation of the image forming apparatus **1**. The recording media Pa and Pb are sheet-like medium such as a paper, a synthesized paper, a thick paper, a special paper, a plastic film, or a fabric. However, the recording media Pa and Pb are not limited to them.

The tray **100** is detachably mounted to the apparatus main body **10**. The tray **100** includes a medium placing portion **102** and a lift-up lever **103**. The lift-up lever **103** is rotatably supported about a shaft portion. The stack of the recording media Pa is placed on the medium placing portion **102**. The lift-up lever **103** is disconnectably connected to a driving motor **104** provided in the apparatus main body **10**. When the tray **100** is mounted to the apparatus main body **10**, the control unit **30** detects that the tray **100** is mounted, and activates the driving motor **104**. The lift-up lever **103** is rotated by a rotational driving force transmitted from the driving motor **104**, and a tip of the lift-up lever **103** abuts against a bottom of the medium placing portion **102**, so that the lift-up lever **103** pushes the medium placing portion **102** upward. As the media Pa placed on the medium placing portion **102** moves upward, the uppermost recording medium Pa contacts a pickup roller **122**. An upward movement sensor **121** detects that the uppermost recording medium Pa reaches the pickup roller **122**, and outputs detection signal to the control unit **30**. When the control unit **30** receives the detection signal sent from the upward movement sensor **121**, the control unit **30** stops the driving motor **104**. A medium detection sensor **125** and a remaining amount detection sensor **126** are provided in the vicinity of the pickup roller **122**. The medium detection sensor **125** is used for detecting a presence or absence of the recording medium Pa. The remaining amount detection sensor **126** is used for detecting a remaining amount of the recording medium Pa. The control unit **30** can detect the presence or absence of the recording medium Pa in the tray **100** based on an output from the medium detection sensor **125**. Further, the control unit **30** can detect the remaining amount of the recording medium Pa in the tray **100** based on an output from the remaining amount detection sensor **125**.

The pickup roller **122** is driven by a rotational driving force transmitted from a driving motor (not shown), and rotates counterclockwise to feed the recording medium Pa out of the tray **100**. The pickup roller **122** has a one-way clutch mechanism therein that transmits a rotational driving force in only one direction, and is rotatable in a direction shown by an arrow (counterclockwise) even when the rotational driving force is not given. The recording medium Pa fed out from the tray **100** is supplied to a nip portion between the feed roller **123** and the retard roller **124** (i.e., a portion where the feed roller **123** and the retard roller **124** are pressed against each other). The feed roller **123** is driven by a rotational driving force transmitted from a driving motor (not shown), and rotates counterclockwise as shown by an arrow. The feed roller **123** and the retard roller **124** feed each recording medium Pa into a conveying path. The retard roller **124** rotates following the rotation of the feed roller **123**, and generates a torque in a direction opposite to a feeding direction of the recording medium Pa. Therefore, even when a plurality of the recording media Pa are fed out of the tray **100**, the feed roller **123** and the retard roller **124** separate the recording media Pa from each other, and feed each recording medium Pa into the conveying path. The feed roller **123** has a one-way clutch mechanism therein, and is rotatable in a direction shown by an arrow (counterclockwise) even when the rotational driving force is not given.

A first medium sensor **131**, a pair of conveying rollers **132**A and **132**B, a second medium sensor **133**, a pair of conveying rollers **134**A and **134**B, a pair of conveying rollers **135**A and **135**B, and a third medium sensor **136** are provided downstream of the feed roller **123** along the conveying path of the recording medium Pa. The conveying rollers **132**A, **132**B, **134**A, **134**B, **135**A and **135**B are driven by rotational driving forces transmitted from a conveyance driving motor (not shown) and respectively rotate in directions shown by arrows to convey the medium Pa. Further, the conveying rollers **132**A and **132**B have a mechanism to prevent a skew (i.e., an inclination of the recording medium Pa with respect to the conveying direction) of the recording medium Pa.

The medium sensors **131**, **133** and **136** are configured to detect passage of the recording medium Pa in a contact manner or a non-contact manner. The control unit **30** controls timing to start rotating the conveying rollers **132**A and **132**B based on detection signal outputted by the first medium sensor **131**, and controls timing to start rotating the conveying rollers **134**A and **134**B based on detection signal outputted by the second medium sensor **133**. The third medium sensor **136** (i.e., a writing sensor) is disposed between the conveying rollers **135**A and **135**B and the secondary transfer roller **137**. The control unit **30** controls, for example, operations timings of the image forming units **20**K, **20**C, **20**M and **20**Y and a driving speed of the intermediate transfer belt **701** based on detection signal outputted from the third medium sensor **136**.

The MPT **110** is detachably mounted to the apparatus main body **10**. The MPT **110** includes a medium placing portion **114** for placing a plurality of sheet-like recording media Pb thereon. For example, the recording media Pb of an irregular size or relatively thick recording media Pb are placed on the medium placing portion **114**. A pickup roller **112**, a feed roller **111** and a retard roller **113** are provided in the vicinity of a tip of the medium placing portion **114**. The feed roller **111** and the retard roller **113** constitute a pair of rollers facing each other. The pickup roller **112** is driven by a rotational driving force transmitted from a driving roller (not shown), and rotates clockwise as shown by an arrow to feed the recording medium Pb from the MPT **110**. The recording medium Pb fed out from the MPT **110** is supplied to a nip portion between the feed roller **111** and the retard roller **113** (i.e., a portion where the feed roller **111** and the retard roller **113** are pressed against each other). The feed roller **111** is driven by a rotational driving force transmitted from a driving roller (not shown), and rotates clockwise as shown by an arrow. The feed roller **111** and the retard roller **113** feed each recording medium Pb into a conveying path. The retard roller **113** rotates following a rotation of the feed roller **111**, and generates a torque in a direction opposite to a feeding direction of the recording medium Pb. Therefore, even when a plurality of the recording media Pb are fed out of the MPT **110**, the feed roller **111** and the retard roller **113** separate the recording media Pb from each other, and feed each recording medium Pb toward the conveying rollers **134**A and **134**B.

FIG. **2** is a schematic view showing the image forming units **20**K, **20**C, **20**M and **20**Y and the intermediate transfer belt unit **700** according to the first embodiment. The intermediate transfer belt unit **700** is also referred to as a first unit (or a transfer unit).

The intermediate transfer belt unit **700** includes an intermediate transfer belt **701** as an intermediate transfer body, a driving roller **702** for driving the intermediate transfer belt **701**, a tension roller **703** as a driven roller, a resilient member **710** that biases the tension roller **703** in a predetermined direction, a backup roller **704**, auxiliary rollers **711** and **712**, primary rollers **705**K, **705**C, **705**M and **705**Y, and a belt cleaning unit **706**. The driving roller **702**, the tension roller **703**, the backup roller **704** and the auxiliary rollers **711** and **712** are supported so as to be rotatable about respective rotation axes extending in a direction (i.e., Z direction) perpendicular to the plane of FIG. **2**.

The intermediate transfer belt **701** is an endless belt made of, for example, resin material such as polyimide resin. The intermediate transfer belt **701** is stretched around the driving roller **702**, the tension roller **703**, the backup roller **704** and the auxiliary rollers **711** and **712**. The driving roller **702** is driven by a rotational driving force transmitted from a driving motor (not shown) and rotates clockwise to move (rotate) the intermediate transfer belt **701**. The resilient member **710** is made of, for example, a coil spring. The resilient member **710** biases the tension roller **703** to apply a suitable tension to an entire body of the intermediate transfer belt **701**, so as to reduce fluctuation of the tension of the intermediate transfer belt **701**. The driving roller **702**, the tension roller **703** and the resilient member **710** constitute a driving mechanism for driving the intermediate transfer belt **701**.

The image forming units **20**K, **20**C, **20**M and **20**Y are configured to form images (i.e., developer images) formed by developer (for example, powder toner) of black (K), cyan (C), magenta (M) and yellow (Y). The black image forming unit **20**K includes a developer storage unit **420**K storing black developer, a process unit **400**K detachably held by a unit holding portion **800**K, and an exposure unit **500**K. The developer storage unit **420**K is placed on a top plate **16** that constitutes a part of the apparatus main body (i.e., the frame) **10**. The developer storage body **420**K supplies the black developer to the process unit **400**K through a through-hole formed on the top plate **16** and a developer supply hole formed on the unit holding portion **800**K.

The process unit **400**K includes a photosensitive drum **401**K as an image bearing body, a charging roller **402**K that uniformly charges a surface of the photosensitive drum **401**K, a developing roller **404**K as a developer bearing body (i.e., a developing portion), a supply roller **403**K, and a drum cleaning portion **405**K. The supply roller **403**K supplies the developer (supplied from the developer storage body **420**K) to a surface of the developing roller **404**K. The drum cleaning portion **405**K scrapes the developer remaining on the surface of photosensitive drum **401**K after the primary transfer of the developer image. The photosensitive drum **401**K has a cylindrical shape. The photosensitive drum **401**K is driven by a rotational driving force transmitted from a drum motor (not shown) and rotates counterclockwise as shown by an arrow. The photosensitive drum **401**K includes a metal pipe (i.e., a conductive supporting body) made of aluminum and a photoconductive layer formed on the metal pipe and made of organic photoconductor (OPC) of the like. The process unit **400**K also has a developing blade (not shown) for regulating a thickness of a developer layer (i.e., a toner layer) on the surface of the developing roller **404**K.

The exposure unit **500**K is disposed in the vicinity of the photosensitive drum **401**K so as to face the surface of the photosensitive drum **401**K. The exposure unit **500**K includes a plurality of LED (Light Emitting Diode) elements arranged along an axial direction of the photosensitive drum **401**K (i.e., Z direction), an LED driving circuit for driving the LED elements, and a lens array for introducing light emitted by the LED elements to the surface of the photosensitive drum **401**K.

The exposure unit **500**K is driven by the control unit **30** to emit light according to a print image so as to expose the surface of the photosensitive drum **401**K. With the exposure, a latent image is formed on the surface of the photosensitive

drum **401**K. When the latent image on the surface of the photosensitive drum **401**K reaches a position facing the developing roller **404**K, the black developer moves to the latent image due to an electric potential difference between the latent image on the surface of the photosensitive drum **401**K and the developing roller **404**K, and a developer image (i.e. a toner image) is formed on the surface of the photosensitive drum **401**K. According to the rotation of the photosensitive drum **401**K, the developer image on the photosensitive drum **401**K moves to a primary transfer position. At the primary transfer position, the intermediate transfer belt **701** is nipped (sandwiched) between the photosensitive drum **401**K and the primary transfer roller **705**K. The developer image is transferred from the photosensitive drum **401**K to the intermediate transfer belt **701** by a transfer voltage is applied to the primary transfer roller **705**K.

The configurations of the image forming units **20**C, **20**M and **20**Y are substantially the same as that of the image forming unit **20**K except the developer.

That is, the cyan image forming unit **20**C includes a developer storage unit **420**C storing a cyan developer, a process unit **400**C detachably held by a unit holding portion **800**C, and an exposure unit **500**C. The developer storage unit **420**C is placed on the top plate **16** of the apparatus main body **10**. The developer storage body **420**C supplies the cyan developer to the process unit **400**C through a through-hole formed on the top plate **16** and a developer supply hole formed on the unit holding portion **800**C. The process unit **400**C includes a photosensitive drum **401**C as an image bearing body, a charging roller **402**C that uniformly charges a surface of the photosensitive drum **401**C, a developing roller **404**C as a developer bearing body (i.e., a developing portion), a supply roller **403**C, and a drum cleaning portion **405**C. The supply roller **403**C supplies the developer (supplied from the developer storage body **420**C) to a surface of the developing roller **404**C. The drum cleaning portion **405**C scrapes the developer remaining on the surface of photosensitive drum **401**C after the primary transfer of the developer image.

The magenta image forming unit **20**M includes a developer storage unit **420**M storing a magenta developer, a process unit **400**M detachably held by a unit holding portion **800**M, and an exposure unit **500**M. The developer storage unit **420**M is placed on the top plate **16** of the apparatus main body **10**. The developer storage body **420**M supplies the magenta developer to the process unit **400**M through a through-hole formed on the top plate **16** and a developer supply hole formed on the unit holding portion **800**M. The process unit **400**M includes a photosensitive drum **401**M as an image bearing body, a charging roller **402**M that uniformly charges a surface of the photosensitive drum **401**M, a developing roller **404**M as a developer bearing body (i.e., a developing portion), a supply roller **403**M, and a drum cleaning portion **405**M. The supply roller **403**M supplies the developer (supplied from the developer storage body **420**M) to a surface of the developing roller **404**M. The drum cleaning portion **405**M scrapes the developer remaining on the surface of photosensitive drum **401**M after the primary transfer of the developer image.

The yellow image forming unit **20**Y includes a developer storage unit **420**Y for storing a yellow developer, a process unit **400**Y detachably held by a unit holding portion **800**Y, and an exposure unit **500**Y. The developer storage unit **420**Y is placed on the top plate **16** of the apparatus main body **10**. The developer storage body **420**Y supplies the yellow developer to the process unit **400**Y through a through-hole formed on the top plate **16** and a developer supply hole formed on the unit holding portion **800**Y. The process unit **400**Y includes a photosensitive drum **401**Y as an image bearing body, a charging roller **402**Y that uniformly charges a surface of the photosensitive drum **401**Y, a developing roller **404**Y as a developer bearing body (i.e., developing portion), a supply roller **403**Y, and a drum cleaning portion **405**Y. The supply roller **403**Y supplies the developer (supplied from the developer storage body **420**Y) to a surface of the developing roller **404**Y. The drum cleaning portion **405**Y scrapes the developer remaining on the surface of photosensitive drum **401**Y after the primary transfer of the developer image.

In this regard, each of the process units **400**K, **400**C, **400**M and **400**Y is also referred to as a second unit. Each of the exposure units **500**K, **500**C, **500**M and **500**Y is also referred to as a third unit. The intermediate transfer belt unit **700** (i.e., the first unit), the process units **400**K, **400**C, **400**M and **400**Y (i.e., the second unit), the exposure units **500**K, **500**C, **500**M and **500**Y (i.e., the third unit) constitute a visible image forming unit.

The process units **400**K, **400**C, **400**M and **400**Y are arranged in a moving direction of the intermediate transfer belt **701** (i.e., in X direction). Four developer images formed by the process units **400**K, **400**C, **400**M and **400**Y are transferred to the surface of the intermediate transfer belt **701** in an overlapping manner, and a color developer image is formed on the intermediate transfer belt **701**. The intermediate transfer belt **701** bears the developer image (i.e., the color develop image) on the surface thereof, and carries the developer image to a secondary transfer position between the backup roller **704** and the secondary transfer roller **137**.

The backup roller **704** and the secondary transfer roller **137** constitute a secondary transfer portion for transferring the developer image to the recording medium Pa (Pb). The backup roller **704** and the secondary transfer roller **137** are disposed so as to face each other, and nip the intermediate transfer belt **701** therebetween. The secondary transfer roller **137** can be formed of, for example, a metal core and a resilient layer (for example, a foamed rubber layer) formed on the surface of the metal core.

The belt cleaning portion **706** is configured to remove a residual developer remaining on the surface of the intermediate transfer belt **701** after the secondary transfer of the developer image. The belt cleaning portion **706** has a cleaning member **715** which is pressed against the surface of the intermediate transfer belt **701** with a constant pressure. The cleaning member **715** scrapes the residual developer (having been carried from the secondary transfer portion) from the intermediate transfer belt **701**.

Referring back to FIG. **1**, the fixing unit **200** has a function to fix the color developer image to the recording medium Pa (Pb) conveyed from the secondary transfer portion. The fixing unit **200** includes an upper roller **201** that has a cylindrical shape and rotates clockwise, and a lower roller **202** that has a cylindrical shape and rotates counterclockwise. The upper roller **201** and the lower roller **202** face each other. A heat source **203**A such as a halogen lamp is provided in the upper roller **201**. A heat source **203**B such as a halogen lamp is provided in the lower roller **202**. Each of the upper roller **201** and the lower roller **202** has a surface layer made of resilient material. The upper roller **201** and the lower roller **202** nip the medium Pa (Pb) therebetween, and apply heat and pressure to the recording medium Pa (Pb). With the application of heat and pressure, the color developer image is molten and fixed to the recording medium Pa (Pb).

The recording medium Pa (Pb) ejected from the fixing unit **200** is ejected by the ejection rollers **142**A, **142**B, **143**A, **143**B, **144**A, **144**B, **145**A and **145**B, and is placed on a stacker portion **150** outside the apparatus main body **10**. The image forming apparatus further includes driving elements

(not shown) such as a stepping motor for rotating the ejection rollers **142**A, **142**B, **143**A, **143**B, **144**A, **144**B, **145**A and **145**B. The control unit **30** control operations of the driving elements.

A configuration of the image forming apparatus **1** will be described in detail.

FIGS. **3** and **4** are perspective views showing a main part of the image forming apparatus **1** having a front cover portion **24** according to the first embodiment. FIG. **3** shows a state where the front cover portion **24** is in a closing position. FIG. **4** shows a state where the front cover portion **24** is in an opening position. FIG. **5**A is a perspective view showing a configuration of the apparatus main body **10** (i.e., the frame) of the image forming apparatus **1**. FIGS. **5**B and **5**C are enlarged views of parts of the apparatus main body **10**. In FIGS. **3**, **4** and **5**A, the top plate **11** (FIG. **1**) is omitted for convenience of illustration.

As shown in FIG. **5**A, the apparatus main body **10** includes a front plate **12** that constitutes a front surface of the apparatus main body **10**, a rear plate **13** that constitutes a rear surface of the apparatus main body **10**, a right side plate **14** that constitutes a right side surface of the apparatus main body **10**, a left side plate **15** that constitutes a left side surface of the apparatus main body **10**, and the top plate **16**. The plates **12** through **16** are formed of metal or resin.

The front plate **12** has three front openings **12***a*, **12***b* and **12***d*. The front opening **12***a* allows the developer storage units (i.e., developer cartridges) **420**K, **420**C, **420**M and **420**Y to be respectively taken out from the apparatus main body **10** in −Z direction, and to be inserted into the apparatus main body **10** in +Z direction. The developer storage units **420**K, **420**C, **420**M and **420**Y are respectively mounted to mounting holes **16***k*, **16***c*, **16***m* and **16***y* (FIG. **5**) of the top plate **16**.

The front opening **12***b* allows the process units (i.e., the developer cartridges) **400**K, **400**C, **400**M and **400**Y to be respectively taken out from the apparatus main body **10** in −Z direction, and to be inserted into the apparatus main body **10** in +Z direction.

The front opening **12***d* (i.e., the lowest opening of the front openings **12***a*, **12***b* and **12***d*) allows the intermediate transfer belt unit **700** to be taken out from the apparatus main body in −Z direction, and to be inserted into the apparatus main body **10** in +Z direction. FIG. **4** shows a state where the developer storage units **420**K, **420**C, **420**M and **420**Y and the process units **400**K, **400**C, **400**M and **400**Y and the intermediate transfer belt unit **700** are mounted in the apparatus main body **10**.

As shown in FIG. **4**, the front cover portion **24** (i.e., a moving member) is rotatably supported by supporting portions **12***e* and **12***f* provided at a lower end of the front plate **12**. FIG. **3** shows a state where the front cover portion **24** is in a position to close the front openings **12***a*, **12***b* and **12***d* (i.e., the closing position). FIG. **4** shows a state where the front cover portion **24** is in a position to open the front openings **12***a*, **12***b* and **12***d* (i.e., the opening position).

The process units **400**K, **400**C, **400**M and **400**Y are detachably mounted to the respective unit holding portions **800**K, **800**C, **800**M and **800**Y (FIG. **2**) provided in the apparatus main body **10**. The image forming apparatus **1** of the first embodiment includes a mechanism for linking the unit holding portions **800**K, **800**C, **800**M and **800**Y and the front cover portion **24**. FIG. **6** is a perspective view showing linking mechanisms (i.e., linking members) **910**R and **910**L configured to link the unit holding portions **800**K, **800**C, **800**M and **800**Y and the front cover portion **24**. In FIG. **6**, the apparatus main body **10**, the developer storage units **420**K, **420**C, **420**M and **420**Y, the process units **400**K, **400**C, **400**M and **400**Y and the intermediate transfer belt unit **700** are omitted.

The linking mechanism **910**R is provided in the vicinity of the right side plate **14**. As shown in FIG. **6**, the linking mechanism **910**R includes an arm member **911**R, a lever member **912**R, a driven lever member **914**R and a lever-linking member **913**R. An end portion of the arm member **911**R is rotatably connected to an end portion of the front cover portion **24** at a connecting portion **911***e*. The other end portion of the arm member **911**R is rotatably connected to the lever member **912**R at a connecting portion **911***g*. The lever member **912**R is rotatably connected to a supporting portion **912***g* provided on the right side plate **14** (not shown in FIG. **6**). To be more specific, the lever member **912**R is rotatably mounted to the right side plate **14** via a mounting element **916**R as shown in FIG. **4**. The lever member **912**R is rotatable about the supporting portion **912***g* of the apparatus main body **10**.

The driven lever member **914**R is rotatably connected to a supporting portion **914***g* provided on the right side plate **14** (not shown in FIG. **6**). To be more specific, the driven lever member **914**R is rotatably mounted to the right side plate **14** via a mounting element **917**R as shown in FIG. **4**. The driven lever member **914**R is rotatable about the supporting portion **914***g* of the apparatus main body **10**.

The lever-linking member **913**R is configured to link the lever member **912**R and the driven lever member **914**R. The lever-linking member **913**R has a function to transmit compression force or tension force from the lever member **912**R to the driven lever member **914**R. An end portion of the lever-linking member **913**R is rotatably connected to an end portion of the lever member **912**R at a connecting portion **912***e*. The other end portion of the lever-linking member **913**R is rotatably connected to an end portion of the driven lever member **914**R at a connecting portion **913***e*. Therefore, the driven lever member **914**R moves is conjunction with the lever member **912**R. For example, when the lever member **912**R rotates clockwise about the supporting portion **912***g*, the driven lever member **914**R rotates clockwise about the supporting portion **914***g*. When the lever member **912**R rotates counterclockwise about the supporting portion **912***g*, the driven lever member **914**R rotates counterclockwise about the supporting portion **914***g*.

The linking mechanism **910**L is provided in the vicinity of the left side plate **15**. As shown in FIG. **6**, the linking mechanism **910**L includes an arm member **911**L, a lever member **912**L, a driven lever member **914**L and a lever-linking member **913**L. An end portion of the arm member **911**L is rotatably connected to an end portion of the front cover portion **24** at a connecting portion **911***f*. The other end portion of the arm member **911**L is rotatably connected to the lever member **912**L at a connecting portion **911***h*. The lever member **912**L is rotatably connected to a supporting portion **912***h* of the left side plate **15** (not shown in FIG. **6**). The lever member **912**L is rotatable about the supporting portion **912***h*. The driven lever member **914**L is rotatably connected to a supporting portion **914***h* of the left side plate **15** (not shown in FIG. **6**). The driven lever member **914**L is rotatable about the supporting portion **914***h* of the apparatus main body **10**.

The lever-linking member **913**L is configured to link the lever member **912**L and the driven lever member **914**L. The lever-linking member **913**L has a function to transmit compression force or tension force from the lever member **912**L to the driven lever member **914**L. An end portion of the lever-linking member **913**L is rotatably connected to an end portion of the lever member **912**L at a connecting portion **912***f*. The other end portion of the lever-linking member **913**L is rotatably connected to an end portion of the driven lever member

914L at a connecting portion 913*f*. Therefore, the driven lever member 914L moves in conjunction with the lever member 912L. For example, when the lever member 912L rotates clockwise about the supporting portion 912*h*, the driven lever member 914L rotates clockwise about the supporting portion 914*h*. When the lever member 912L rotates counterclockwise about the supporting portion 912*h*, the driven lever member 914L rotates counterclockwise about the supporting portion 914*h*.

A front beam unit 920F extending in X direction has end portions that are mounted to the lever members 912R and 912L. To be more specific, a cap member 952R provided at an end of the front beam unit 920F engages a through-hole (i.e., a support hole) of the right lever member 912R. A cap member 952L provided at the other end of the front beam unit 920F engages a through-hole (i.e., a support hole) of the left lever member 912L. Therefore, the lever members 912R and 912L rotatably support the cap members 952R and 952L of the front beam unit 920F.

A rear beam unit 920R extending in X direction has end portions that are mounted to the driven lever members 914R and 914L. To be more specific, a cap member 952R provided at an end of the rear beam unit 920R engages a through-hole (i.e., a support hole) of the right driven lever member 914R. A cap member 952L provided at the other end of the rear beam unit 920R engages a through-hole (i.e., a support hole) of the left driven lever member 914L. Therefore, the driven lever members 914R and 914L rotatably support the cap members 952R and 952L of the rear beam unit 920R.

Further, the front beam unit 920F supports front portions of the unit holding portions 800K, 800C, 800M and 800Y in a suspending manner. The rear beam unit 920R supports rear portions of the unit holding portions 800K, 800C, 800M and 800Y in a suspending manner.

The linking mechanisms 910R and 910L cause the unit holding portions 800K, 800C, 800M and 800Y to move upward (in +Y direction) in conjunction with a rotational operation (i.e., an opening operation) of the front cover portion 24 from the closing position (FIG. 3) to the opening position (FIG. 4). FIG. 7A is a right side view showing the linking mechanism 910R when the front cover portion 24 is in the closing position. FIG. 7B is a right side view showing the linking mechanism 910R when the front cover portion 24 is in the opening position.

When the front cover portion 24 rotates from the closing position (i.e., a first position) shown in FIG. 7A to the opening position (i.e., a second position) shown in FIG. 7B, the connecting portion 911*e* (between the arm member 911R and the front cover member 24) rotates counterclockwise about the supporting portion 12*e* in conjunction with the opening operation of the front cover portion 24, and moves upward by a height h. In this state, a force causing the front cover portion 24 to rotate is exerted on the connecting portion 911*e* via the supporting portion 12*e* according to principle of leverage. Therefore, as the front cover portion 24 rotates from the closing position to the opening position, the arm member 911R pushes the end of the lever member 912R upward via the connecting portion 911*g*. In this state, the lever member 912R rotates clockwise about the supporting portion 912*g*. Further, a force pushing the end of the lever member 912R upward is exerted on the cap member 952R via the supporting portion 912*g* according to principle of leverage.

According to the same principle, in the left linking mechanism 910L, as the front cover portion 24 rotates from the closing position to the opening position, a force pushing the end of the lever member 912L upward is exerted on the cap member 952L via the supporting portion 912*h*. Therefore, as the front cover portion 24 rotates from the closing position toward the opening position, the lever members 912R and 912L cause the front beam unit 920R to move upward.

Similarly, the driven lever members 914R and 914L respectively rotate about the supporting portions 914*g* and 914*h* in conjunction with the lever members 912R and 912L, and cause the rear beam unit 920R to move upward. Accordingly, the unit holding portions 800K, 800C, 800M and 800Y move in a direction away from the intermediate transfer belt unit 700 (FIG. 4) in conjunction with the opening operation of the front cover portion 24.

In this way, the linking mechanisms 910R and 910L cause the unit holding portions 800K, 800C, 800M and 800Y to move in a direction away from the intermediate transfer unit belt unit 700 in conjunction with the opening operation of the front cover portion 24.

The process units 400K, 400C, 400M and 400Y are respectively mounted to the unit holding portions 800K, 800C, 800M and 800Y. Therefore, when the front cover portion 24 rotates from the opening position to the closing position, the linking mechanism 910R and 910L (and the beam units 920F and 920R) cause the process units 400K, 400C, 400M and 400Y to move away from the intermediate transfer belt unit 700 in conjunction with the opening operation of the front cover portion 24. In contrast, when the front cover portion 24 rotates from the opening position to the closing position, the linking mechanisms 910R and 910L (and the beam units 920F and 920R) cause the process units 400K, 400C, 400M and 400Y to move toward the intermediate transfer belt unit 700 in conjunction with the closing operation of the front cover portion 24. In this regard, the linking mechanisms 910R and 910L and the beam units 920F and 920R constitute a first mechanism that causes the intermediate transfer belt unit 700 and the process units 400K, 400C, 400M and 400Y to move toward or away from each other.

Next, configurations of the unit holding portions 800K, 800C, 800M and 800Y will be described in detail. FIGS. 8 and 9 are perspective views showing the unit holding portion 800K for mounting the black process unit 400K. More specifically, FIG. 8 is a bottom front perspective view showing the unit holding portion 800K. FIG. 9 is a top rear perspective view showing the unit holding portion 800K. The unit holding portion 800K is formed of metal material and resin material. The other unit holding portions 800C, 800M and 800Y have the same configuration as the unit holding portion 800K.

As shown in FIG. 8, the unit holding portion 800K includes a main body 801 and a rear plate 803 connected to a rear end of the main body 801. Guide portions (i.e., guide rails) 801*a* and 801*b* are formed on the main body 801. The guide portions 801*a* and 801*b* are in the form of rails, and extend from a front end to the rear end of the main body 801. Lock pieces 802R and 802L are mounted to front ends of the guiding portions 801*a* and 801*b*. To-be-guided portions (in the form of rails) of the process unit 400K are detachably mounted to the guide portions 801*a* and 801*b* as described later.

As shown in FIG. 9, the main body 801 of the unit holding portion 800K has a developer supply opening 808. The developer supply opening 808 is formed at a center portion of the main body 801. Protrusions (i.e., hooks) 804R, 804L, 805R and 805L are fixed to the many body 801. The protrusions 804R, 804L, 805R and 805L are used to suspend the unit holding portion 800K from the beam units 920F and 920R (FIG. 6). As shown in FIG. 6, the front beam unit 920F is inserted into through-holes of the protrusions 804R and 804L on a front side. The rear beam unit 920R is inserted into through-holes of the protrusions 805R and 805L on a rear side.

As shown in FIGS. **8** and **9**, an elongated hole **803***r* (i.e., a to-be engaged hole) is formed on the rear plate **803** of the unit holding portion **800**K. The elongated hole **803***r* is elongated in Y direction. Further, an elongated hole **801***f* (FIG. **8**) is formed on a front end surface of the main body **801**. The elongated hole **801***f* is elongated in Y direction. The elongated hole **803***r* and the elongated hole **801***f* are provided for restricting positions of the exposure unit **500**K in X direction and Y direction.

Further, the rear plate **803** has insertion holes **803***a* and **803***b* substantially in the form of circles. The through-holes **803***a* engages a positioning pin **411** (FIG. **11**) of the process unit **400**K. The through-holes **803***b* receives a sleeve **410** (FIG. **11**) of the process unit **400**K. As shown in FIG. **8**, a connection terminal **806** is formed on an inner surface of the rear plate **803**. The connection terminal **806** is biased in −Z direction by a biasing member (not shown) such as a coil spring. The connection terminal **806** contacts and is electrically connected to an electric contact **413** (FIG. **11**) as described later.

Next, the configurations of the process units **400**K, **400**C, **400**M and **400**Y will be described. FIGS. **10** through **12** are perspective view showing the process unit **400**K. More specifically, FIG. **10** is a top and front perspective view of the process unit **400**K. FIG. **11** is a bottom and rear perspective view of the process unit **400**K. FIG. **12** is a longitudinal sectional view of the process unit **400**K taken along line XII-XII in FIG. **10**. The process units **400**C, **400**M and **400**Y have the same configurations as the process unit **400**K.

As shown in FIG. **10**, a handle portion **407** is provided at a front end portion of the process unit **400**K. The handle portion **407** is used when a user mounts the process unit **400**K to the unit holding portion **800**K or detaches the process unit **400**K from the unit holding portion **800**K. The user can grip the handle portion **407** to operate the process unit **400**K.

As shown in FIG. **10**, a rail portion **408**R is formed on a right side surface of the process unit **400**K. The rail portion **408**R extends in Z direction. As shown in FIG. **11**, a front rail portion **408**LF and a rear rail portion **408**LR are formed on a left side surface of the process unit **400**K. When the process unit **400**K is mounted to the unit holding portion **800**K, the rail portion **408**R is guided by the guide portion **801***a* of the unit holding portion **800**K, and the front rail portion **408**LF and the rear rail portion **408**LR are guided by the guide portion **801***b* of the unit holding portion **800**K.

FIG. **13** is a sectional view showing a part of the process unit **400**K in a state where the process unit **400**K is mounted to the unit holding portion **800**K. As shown in FIG. **13**, when the process unit **400**K is mounted to the unit holding portion **800**K, the rail portion **408**R of the process unit **400**K moves beyond the lock piece **802**R to reach the guide portion **801***a*, and is mounted to the guide portion **801***a*. In this state, a contact surface **408**Ra (i.e., a tip end surface) of the rail portion **408**R engages a rear end surface of the lock piece **802**R. Therefore, a position of the process unit **400**K in Z direction is determined. Similarly, the front rail portion **408**LF and the rear rail portion **408**LR move beyond the lock piece **802**L and reach the guide portion **801***b* (FIG. **8**), and are mounted to the guide portion **801***b*. In this state, a contact surface **408**La (i.e., a tip end surface) of the front rail portion **408**LF engages a rear end surface of the lock piece **802**L, and therefore the position of the process unit **400**K in Z direction is determined.

Upon detaching the process unit **400**K from the unit holding portion **800**K, the user lifts the process unit **400**K upward in +Y direction, releases engagement between the rail portion **408**R and the lock piece **802**R, and releases engagement between the front rail portion **408**LF and the lock piece **802**L.

As shown in FIGS. **10** and **12**, the process unit **400**K has engagement pin **414** that protrudes in +Z direction. As shown in FIG. **5**A, engagement holes **12***k*, **12***c*, **12***m* and **12***y* are formed on a front plate **12** of the apparatus main body **10**. FIG. **5**B is an enlarged view of the engagement hole **12***k* for the process unit **400**K. When the process unit **400**K is mounted to the unit holding portion **800**K, the engagement pin **414** of the process unit **400**K engages the engagement hole **12***k* of the front plate **12** to determine the position of the process unit **400**K in X direction and in Z direction.

Further, as shown in FIG. **12**, the process unit **400**K includes the photosensitive drum **401**K having a cylindrical shape. A shaft portion **401**Ka of the photosensitive drum **401**K is rotatably supported. An end of the shaft portion **401**Ka is supported by a sleeve **410** of the process unit **400**K via a coupling **412**.

As shown in FIG. **11**, a tip of the coupling **412** has a concave-convex shape for transmitting a rotational driving force from the drum motor (not shown) to the shaft portion **401**Ka of the photosensitive drum **401**K. The sleeve **410** engages the through-hole **803***b* of the unit holding portion **800**K shown in FIGS. **8** and **9**, and determines a position of the sleeve **410** with respect to the unit holding portion **800**K. A positioning pin **411** (FIG. **11**) is formed on a rear end portion of the process unit **400**K. The positioning pin **411** engages a through-hole **803***a* of the unit holding portion **800**K shown in FIGS. **8** and **9** to prevent a rotation of the process unit **400**K upon mounting the process unit **400**K.

An electric contact **413** is provided at a rear portion of the process unit **400**K. The electric contact **413** contacts the connection terminal **806** (FIG. **8**) of the unit holding portion **800**K when the process unit **400**K is mounted to the unit holding portion **800**K. Bias voltages for image forming process are applied to the process unit **400**K via the electric contact **413**. The electric contact **413** is resiliently biased in −Z direction, and therefore pushes the process unit **400**K in −Z direction upon mounting the process unit **400**K. Therefore, the contact surface **408**Ra of the rail portion **408**R contacts the rear end surface of the lock piece **802**R of the unit holding portion **800**K. The contact surface **408**La of the rail portion **408**LF contacts the rear end surface of the lock piece **802**L of the unit holding portion **800**K. As a result, a relative position of the process unit **400**K with respect to the unit holding portion **800**K is determined.

As shown in FIGS. **11** and **12**, protruding portions **409**R and **409**F are formed on a bottom of the process unit **400**K. The protruding portions **409**R and **409**F are used to determine the position of the process unit **400**K with respect to the intermediate transfer belt unit **700** described later. Further, as shown in FIG. **12**, the process unit **400**K has positioning pins **415**F and **415**R and head abutment portions (i.e., head abutment pieces) **416**F and **416**R formed between a side wall **406** and the rail portion **408**R. The positioning pins **415**F and **415**R and the head abutment portions **416**F and **416**R are used to determine the position of the process unit **400**K with respect to the exposure unit **500**K in X direction and Z direction.

FIGS. **14** and **15** are perspective views of the intermediate transfer belt unit **700**. More specifically, FIG. **14** is a top front perspective view showing the intermediate transfer belt unit **700**. FIG. **15** is a bottom rear perspective view showing the intermediate transfer belt unit **700**.

The intermediate transfer belt unit **700** includes a frame **708** made of metal. The intermediate transfer belt unit **700** further includes a driving roller **702**, a tension roller **703**, and

a backup roller **704** which are rotatably supported by the frame **708**. The intermediate transfer belt **701** is stretched around the driving roller **702**, the tension roller **703** and the backup roller **704**.

The frame **708** includes a front frame **708**F and a rear frame **708**R. As shown in FIG. **14**, a pair of handles **721** and **722** are provided on the front frame **708**F. A user can grip the handles **721** and **722** to move the intermediate transfer belt unit **700**. As shown in FIG. **15**, positioning pins **709**R and **709**L are provided on an inner surface of the front frame **708**F. Positioning pins **710**R and **710**L are provided on the rear frame **708**R. The positioning pins **709**R, **709**L, **710**F and **710**R are used to determine the position of the intermediate transfer belt unit **700** when the intermediate transfer belt unit **700** is mounted to the apparatus main body **10**. Therefore, for example, the positioning pins **709**R and **709**L respectively engage engagement holes **12***h* and **12***i* formed on the front plate **12** shown in FIG. **5**. The positioning pin **710**L also functions as a driving shaft that transmits a rotational driving force to the driving roller **702**.

Further, as shown in FIG. **14**, V-shaped receiving grooves **708***f*K, **708***f*C, **708***f*M and **708***f*Y are formed at an upper end of the front frame **708**F. Further, V-shaped receiving grooves **708***r*K, **708***r*C, **708***r*M and **708***r*Y are formed at an upper end of the rear frame **708**R. The receiving grooves **708***f*K and **708***r*K are used to determine the position of the process unit **400**K with respect to the intermediate transfer belt unit **700**. The receiving grooves **708***f*C and **708***r*C are used to determine the position of the process unit **400**C with respect to the intermediate transfer belt unit **700**. The receiving grooves **708***f*M and **708***r*M are used to determine the position of the process unit **400**M with respect to the intermediate transfer belt unit **700**. The receiving grooves **708***f*Y and **708***r*Y are used to determine the position of the process unit **400**Y with respect to the intermediate transfer belt unit **700**.

FIG. **16**A is a perspective view showing a positional relationship between the intermediate transfer belt unit **700** and the process unit **400**K. FIGS. **16**B and **16**C are enlarged views of an engaging portion between the intermediate transfer belt unit **700** and the process unit **400**K. As shown in FIGS. **16**B and **16**C, the protruding portion **409**R of the process unit **400**K engages the receiving groove **708***r*K of the rear frame **708**R, and the protruding portion **409**F of the process unit **400**K engages the receiving groove **708***f*K of the front frame **708**F.

Next, description will be made of the beam units **920**F and **920**R that support the unit holding portions **800**K, **800**C, **800**M and **800**Y in a suspending manner. FIG. **17** is a perspective view showing the front beam unit **920**F. The rear beam unit **920**R has the same configuration as the front beam unit **920**F.

As shown in FIG. **17**, the front beam unit **920**F includes a beam member (i.e., a frame) **951**, cap members **952**R and **952**L provided at both ends of the beam member **951**. The cap member **952**R includes a cylindrical portion **952**Ra and an engagement portion **952**Rb with a groove extending in Y direction. The cap member **952**L includes a cylindrical portion **952**La and an engagement portion **952**Lb with a groove extending in Y direction. As shown in FIG. **6**, the cap members **952**R and **952**L respectively engage through-holes (i.e., support holes) formed on the lever members **912**R and **912**L, and are supported by the lever members **912**R and **912**L. Further, the engagement portions **952**Rb and **952**Lb respectively slidably engage protrusions formed on rectangular holes of the right side plate **14** and the left side plate **15** of the apparatus main body **10**. For example, the engagement portion **952**Lb of the front beam unit **920**F engages the protrusion **14***e* on the rectangular hole formed on the right side plate **14** shown in FIGS. **5**A and **5**C. Similarly, the engagement portion of the rear beam unit **920**R engages the protrusion **14***f* on the rectangular hole formed on the right side plate **14** shown in FIGS. **5**A and **5**C.

The front beam unit **920**F includes biasing pieces **955**A, **955**B, **955**C, **955**D, **955**E, **955**F, **955**G and **955**H which are biased in −Y direction by a resilient member such as a coil spring. The biasing pieces **955**A through **955**H contact the unit holding portions **800**K through **800**Y (supported by the beam unit **920**F) and bias the unit holding portions **800**K through **800**Y in −Y direction. More specifically, the biasing pieces **955**A and **955**B bias an upper surface of the unit holding portion **800**K in −Y direction. The biasing pieces **955**C and **955**D bias an upper surface of the unit holding portion **800**C in −Y direction. The biasing pieces **955**E and **955**F bias an upper surface of the unit holding portion **800**M in −Y direction. The biasing pieces **955**G and **955**H bias an upper surface of the unit holding portion **800**Y in −Y direction.

Each of the beam units **920**F and **920**R includes four linking mechanisms for linking the unit holding portions **800**K, **800**C, **800**M and **800**Y and the exposure units **500**K, **500**C, **500**M and **500**Y. Each linking mechanism is configured to cause the exposure units **500**K, **500**C, **500**M and **500**Y to move toward or away from the unit holding portions **800**K, **800**C, **800**M and **800**Y in conjunction with the operation of the linking mechanisms **910**R and **910**L shown in FIG. **6**.

FIG. **18** is a schematic sectional view showing one of the linking mechanisms for linking the unit holding portions **800**K, **800**C, **800**M and **800**Y and the exposure unit **500**K. The linking mechanism shown in FIG. **18** includes a linking lever member **954**K for linking the linking mechanisms **910**R and **910**L (FIG. **6**) and the exposure unit **500**K, and a pivoting plate (i.e., a movement restriction member) **953**K that restricts a movement of an end portion of the linking lever member **954**K relative to the apparatus main body **10**.

The end portion of the linking lever member **954**K is rotatably connected to a supporting portion **954***c* provided on the beam member **951**. Further, a lower end portion of the pivoting plate **953**K is also connected to the supporting portion **954***c*. The pivoting plate **953**K protrudes from a through-hole **951***k* of the beam member **951**. An upper end portion of the pivoting plate **953**K is fixed to the top plate **16** of the apparatus main body **10**. The other end portion of the linking lever member **954**K has a mounting hole **954***a* to which a front connection piece **510** of the exposure unit **500**K is rotatably connected as described later. Further, the linking lever member **954**K has an elongated hole (i.e., an engagement hole) **954***h* formed between the supporting portion **954***c* and the mounting hole **954***a*. A support pin **958**K fixed to the beam member **951** engages the elongated hole **954***h*.

The beam member **951** has resilient members **956**A and **956**B therein. The resilient members **956**A and **956**B resiliently bias the biasing pieces **955**A and **955**B in −Y direction. The biasing pieces **955**A and **955**B are configured to bias the unit holding portion **800**K supported by the front beam unit **920**F in a suspending manner.

When the beam member **951** moves in Y direction (i.e., upward or downward), a force vertically moving the beam member **951** is applied to the support pin **958**K. The force applied to the support pin **958**K is also applied to the mounting hole **954***a* (i.e., a point of application of the force) via the supporting portion **954***c* according to principle of leverage. As a result, the linking lever member **954**K rotates clockwise or counterclockwise about the supporting portion **954***c*, and

causes the connection piece **510** of the exposure unit **500**K to move upward or downward relative to the front beam unit **920**F.

FIG. **19** is a schematic view showing states of the linking lever member **954**K linked with the beam member **951**. According to the opening operation of the front cover portion **24**, the beam member **951** moves upward. In conjunction with the upward movement of the beam member **951**, the linking lever member **954**K rotates from a position shown by a dashed line to a position shown by a solid line. According to the closing operation of the front cover portion **24**, the beam member **951** moves downward. In conjunction with the downward movement of the beam member **951**, the linking lever member **954**K rotates (i.e., returns) from the position shown by the solid line to the position shown by the dashed line.

As shown in FIG. **19**, a distance from a center of the supporting portion **954***c* to a center of the support pin **958**K in a lateral direction (i.e., X direction) is expressed as X**1**. A distance from a center of the supporting portion **954***c* to a center of the mounting hole **954***a* is expressed as X**2**. A distance move by the support pin **958**K in a vertical direction (i.e., Y direction) according to the opening/closing operation of the front cover member **24** is expressed as Y**1**. In this state, the mounting hole **954***a* rotates about the supporting portion **954***c* according to principle of leverage, and therefore moves a distance Y**2** greater than the distance Y**1**. In this state, the following equation is satisfied: Y**2**=Y**1**×(X**2**/X**1**). For example, when it is assumed that X**1** is 26 mm, X**2** is 50 mm and Y**1** is 14 mm, the result is that Y**2** is 26.9 mm.

The front beam unit **920**F includes the linking mechanisms for other exposure units **500**C, **500**M and **500**Y which are similar to the linking mechanism for the exposure unit **500**K. As shown in FIG. **17**, the front beam unit **920**F includes a pivoting plate **953**C, a linking lever member **954**C and a support pin **958**C that constitute a linking mechanism for linking the exposure unit **500**C and the unit holding portions **800**K through **800**Y. The front beam unit **920**F further includes a pivoting plate **953**M, a linking lever member **954**M and a support pin **958**M that constitute a linking mechanism for linking the exposure unit **500**M and the unit holding portions **800**K through **800**Y. The front beam unit **920**F further includes a pivoting plate **953**Y, a linking lever member **954**Y and a support pin **958**Y that constitute a linking mechanism for linking the exposure unit **500**Y and the unit holding portions **800**K through **800**Y. The pivoting plates **953**C, **953**M and **953**Y respectively protrude upward from through-holes **951***c*, **951***m* and **951***y* formed on the beam member **951**, and are fixed to the top plate **16**.

In this regard, the linking lever members **954**K, **954**C, **954**M and **954**Y and the pivoting plates **953**K, **953**C, **953**M and **953**Y constitute a second mechanism that causes the process unit **400**K, **400**C, **400**M and **400**Y (i.e., the second unit) and the exposure units **500**K, **500**C, **500**M and **500**Y (i.e., the third unit) to move toward or away from each other.

The rear beam unit **920**R has the linking mechanisms having the same configurations as those of the front beam unit **920**F.

FIG. **20** is a perspective view showing an external configuration of the exposure unit **500**K of the first embodiment. FIG. **21**A is a longitudinal sectional view of the exposure unit **500**K taken along line XXIA-XXIA in FIG. **20**. FIG. **21**B is a bottom view of the exposure unit **500**K. The other exposure units **500**C, **500**M and **500**Y have the same configurations as the exposure unit **500**K.

As shown in FIG. **20**, the exposure unit **500**K includes a holder plate **501** extending in Z direction, and an LED head **504** mounted to the holder plate **501**. The LED head **504** includes a large number of LED elements arranged along the longitudinal direction (i.e., Z direction), and a lens array that introduces light from the LED elements to the surface of the photosensitive drum **401**K. The LED head **504** is resiliently biased in −Y direction by resilient biasing members **505**F and **505**R such as springs.

As shown in FIG. **21**A, groove portions **502***g* and **503***g* are respectively formed on a front end portion **502** and a rear end portion **503** of the holder plate **501**. Protrusions **504***a* and **504***b* are formed on front and rear ends of the LED head **504**. The protrusions **504***a* and **504***b* respectively engage the groove portions **502***g* and **503***g*, so that the holder plate **501** supports the LED head **504** in a suspending manner.

Shaft portions **502***a* and **503***a* are respectively formed on the front end portion **502** and the rear end portion **503** of the exposure unit **500**K. The shaft portions **502***a* and **503***a* respectively engage the elongated holes **801***f* and **803***r* (FIG. **8**) of the unit holding portion **800**K.

As shown in FIGS. **21**A and **21**B, focus adjusting members **506**F and **506**R are provided in the vicinities of both ends of the LED head **504** in the longitudinal direction. The focus adjusting members **506**F and **506**R are configured to contact the head abutment portions (i.e., the head abutment pieces) **416**F and **416**R shown in FIG. **12**. By suitably adjusting outer diameters of the focus adjusting members **506**F and **506**R, a distance between the LED head **504** and the photosensitive drum **401**K can be adjusted so as to obtain an optimum focal position of light emitted by the LED head **504**. As shown in FIGS. **21**A and **21**B, an elongated hole **504***c* is formed on a bottom of the exposure unit **500**K. The positioning pin **415**F of the process unit **400**K shown in FIG. **12** engages the elongated hole **504***c*.

The holder plate **501** has front and rear connection pieces **510** and **511** that protrude upward. Tip portions **510***t* and **511***t* of the connection pieces **510** and **511** respectively rotatably connected to the above described linking mechanisms of the beam units **920**F and **920**R. That is, as shown in FIG. **22**, the tip portion **510***t* of the front connection piece **510** engages the linking lever member **954**K of the linking mechanism of the front beam unit **920**F. The tip portion **511***t* of the rear connection piece **511** engages the linking lever member **954**K of the linking mechanism of the rear beam unit **920**R.

FIGS. **23**A and **23**B are sectional views schematically showing a state of the linking mechanism of the front beam unit **920**F when the front cover portion **24** is in the closing position (FIG. **7**A). FIG. **23**B corresponds to a cross sectional view taken along a Line XXIIIb-XXIIIb in FIG. **23**A. FIGS. **24**A and **24**B are sectional views schematically showing a state of the linking mechanism of the front beam unit **920**F when the front cover portion **24** is in the opening position (FIG. **7**B). FIG. **24**B corresponds to a cross sectional view taken along a Line XXIVb-XXIVb in FIG. **24**A.

When the front cover portion **24** is in the closing position, the unit holding portion **800**K (supported by the front beam unit **920**F in a suspending manner) is apart from the top plate **16** by a predetermined distance as shown in FIGS. **23**A and **23**B. The photosensitive drum **401**K of the process unit **400**K supported by the unit holding portion **800**K is positioned close to the intermediate transfer belt **701**. Further, the LED head **504** is positioned close to the surface of the photosensitive drum **401**K.

In contrast, when the front cover portion **24** rotates from the closing position to the opening position, the unit holding portion **800**K (supported by the front beam unit **920**F in a suspending manner) moves upward as shown in FIGS. **24**A and **24**B. The photosensitive drum **401**K of the process unit

400K supported by the unit holding portion 800K moves away from the intermediate transfer belt 701. Further, according to the rotation of the linking lever member 954K, the LED head 504 moves the distance Y2 (FIG. 19) greater than the moving amount (i.e., distance) Y1 of the front beam unit 920F, and moves away from the surface of the photosensitive drum 401K. In this state, the user can easily detach or replace the process unit 400K through the front opening 12*b* of the front plate 12.

Further, since the photosensitive drum 401K moves away from the intermediate transfer belt 701, and the LED head 504 moves away from the photosensitive drum 401K, it becomes possible to prevent the process unit 400K from contacting the LED head 504 or the intermediate transfer belt 701 when the user mounts the process unit 400K to or detaches the process unit 400K from the apparatus main body 10.

According to the image forming apparatus 1 of the first embodiment, the first mechanism (i.e., the linking mechanisms 910R and 910L and the beam units 920F and 920R) causes the intermediate transfer belt unit 700 (i.e., the first unit) and the process units 400K, 400C, 400M and 400Y (i.e., the second unit) to move toward and away from each other according to the opening/closing operation of the front cover potion 24. Further, the second mechanism (the linking lever members 954K, 954C, 954M and 954Y and the pivoting plates 953K, 953C, 953M and 953Y) causes the process units 400K, 400C, 400M and 400Y (i.e., the second unit) and the exposure units 500K, 500C, 500M and 500Y (i.e., the third unit) to move toward and away from each other in conjunction with the operation of the first mechanism. Therefore, the user can easily detach or replace the process units 400K, 400C, 400M and 400Y through the front opening 12*b* by rotating the front cover portion 24 to the opening position.

The above described embodiment is only a preferred example of the present invention, and various modifications may be made thereto.

In the above described embodiment, the first unit corresponds to the intermediate transfer belt unit 700, and the second unit corresponds to the process units 400K, 400C, 400M and 400Y. Further, the third unit corresponds to the exposure units 500K, 500C, 500M and 500Y. However, the first unit, the second unit and the third unit are not limited to this example. For example, it is also possible that the second unit corresponds to drum units, and the third unit corresponds to developing units.

Further, the image forming apparatus 1 can be provided with a cushion mechanism that generates a force resisting to the rotation of the front cover portion 24.

FIG. 25 is a perspective view showing the cushion mechanism 960 provided between the arm member 911L and the front plate 12 of the apparatus main body 10. The cushion mechanism 960 is configured as a damper, and includes a cylinder 961 and a rod 962 extending from the cylinder 961. A base end of the cylinder 961 is rotatably mounted to the front plate 12 via a mounting element 971. A tip portion of the rod 962 is rotatably mounted to the arm member 911L via a mounting element 972. Fluid such as oil is filled inside the cylinder 961. The fluid generates a force resisting a movement of the rod 962 with respect to the cylinder 961. FIG. 26A shows the cushion mechanism 960 in a state where the front cover portion 24 is in the closing position. FIG. 26B shows the cushion mechanism 960 in a state where the front cover portion 24 is in the opening position. When the front cover portion 24 rotates from the closing position to the opening position, the rod 962 is retracted into the cylinder 961. In contrast, when the front cover portion 24 rotates from the opening position to the closing position, the rod 962 extends from the cylinder 961.

Using the cushion mechanism 960, the user can easily open and close the front cover portion 24. Further, optimum operational feeling can be obtained by adjusting the force (i.e., a resistant force) of the cushion mechanism 960 based on weights of the process units 400K, 400C, 400M and 400Y. In this regard, the damper can be replaced with a resilient member such as a coil spring.

The first and second mechanisms of the above described embodiment are suitably applied to the image forming apparatus 1 configured to transfer an image using the intermediate transfer system. However, the present invention is not limited to such an image forming apparatus. For example, the first and second mechanisms of the above described embodiment are applicable to an image forming apparatus using a direct transfer system.

FIG. 27 is a schematic view showing a configuration of an image forming apparatus 1B using a direct transfer system. The image forming apparatus 1B shown in FIG. 27 is different from the image forming apparatus 1A shown in FIG. 1 in that the image forming apparatus 1B has a medium conveying mechanism 300 instead of the intermediate transfer belt unit 700 (FIG. 1). Further, the image forming apparatus 1B shown in FIG. 27 is different from the image forming apparatus 1A shown in FIG. 1 in a disposition of the top plate 16B. In other respects, the image forming apparatus 1B shown in FIG. 27 is substantially the same as the image forming apparatus 1A shown in FIG. 1. The developer storage portions 420K, 420C, 420M and 420Y are placed on the top plate 16B as a part of the apparatus main body (i.e., the frame) 10B.

The medium conveying mechanism 300 of the image forming apparatus 1B shown in FIG. 27 includes a conveying belt 301, a driving roller 302, a tension roller 303, a resilient member 310, transfer rollers 305K, 305C, 305M and 305Y, and a belt cleaning portion 306. The conveying belt (i.e., a medium conveying member) 301 is configured to convey the recording medium Pa (Pb) supplied by the conveying rollers 134A and 134B. The driving roller 302 drives the conveying belt 301. The tension roller 303 rotates following a rotation of the driving roller 302. The resilient member 310 resiliently biases the tension roller 303 in a predetermined direction. The transfer rollers 305K, 305C, 305M and 305Y are provided so as to face process units 400K, 400C, 400M and 400Y via the conveying belt 301. The driving roller 302, the tension roller 303 and the resilient member 310 constitute a driving mechanism for driving the conveying belt 301. The transfer rollers 305K, 305C, 305M and 305Y transfer the developer images from the photosensitive drums 401K, 401C, 401M and 401Y to the recording medium Pa (Pb) on the conveying belt 301. The conveying belt 301 conveys the recording medium Pa (Pb) to the fixing unit 200.

The belt cleaning portion 306 is configured to remove the developer remaining on the conveying belt 301 after the developer image is transferred to the recording medium Pa (Pb). The belt cleaning portion 306 has a cleaning member 315 contacting the surface of the conveying belt 301 with a constant pressure. The cleaning member 315 scrapes the developer from the conveying belt 301.

The image forming apparatus 1 of the first embodiment includes four image forming units 20K, 20C, 20M and 20Y to form a color image. However, the present invention is not limited to such a configuration. For example, the first and second mechanisms of the above described embodiment can be applied to an image forming apparatus having a single image forming unit configured to form a monochrome image.

The present invention is applicable to a copier, a facsimile machine, a printer and an MFP (Multi Function Peripheral) and the like.

While the preferred embodiments of the present invention have been illustrated in detail, it should be apparent that modifications and improvements may be made to the invention without departing from the spirit and scope of the invention as described in the following claims.

What is claimed is:

**1**. An image forming apparatus, comprising:

an apparatus main body;

a image forming unit that forms a developer image, the image forming unit comprising a first unit, a second unit detachably mounted to the apparatus main body, and a third unit;

a first mechanism that causes the second unit to move relatively toward and away from the first unit in only a substantially vertical direction;

a moving member that moves the first mechanism; and

a second mechanism that causes the third unit to move relatively toward and away from the second unit in only the substantially vertical direction in conjunction with a movement of the first mechanism.

**2**. The image forming apparatus according to claim **1**, wherein the moving member is provided in the apparatus main body so as to move between a first position and a second position, and

wherein when the moving member moves from the first position toward the second position, the first mechanism causes the first unit and the second unit to move away from each other.

**3**. The image forming apparatus according to claim **1**, wherein when the first mechanism causes the first unit and the second unit to move away from each other, the second mechanism causes the second unit and the third unit to move away from each other.

**4**. The image forming apparatus according to claim **1**, further comprising a unit holding portion that holds the second unit.

**5**. The image forming apparatus according to claim **4**, wherein the first mechanism causes the unit holding portion to move away from the first unit.

**6**. The image forming apparatus according to claim **4**, wherein the second unit is detachably mounted to the unit holding portion.

**7**. The image forming apparatus according to claim **6**, wherein the first mechanism comprises:

a beam member that supports the unit holding portion; and

a linking member that links the beam member and an end of the moving member allowing movements of the beam member and the end of the moving member,

wherein the linking member causes the second unit to move away from the first unit by causing the beam member to move in a predetermined direction in conjunction with a movement of the moving member.

**8**. The image forming apparatus according to claim **7**, wherein the linking member comprises:

an arm member having an end portion rotatably connected to an end portion of the moving member;

a lever member rotatably connected to the other end portion of the arm member and rotatably connected to the beam member,

wherein the lever member causes the beam member to move in the predetermined direction in conjunction with the movement of the moving member.

**9**. The image forming apparatus according to claim **8**, wherein the first mechanism further comprises:

a driven lever member that rotatably engages the other end portion of the beam member; and

a lever-linking member that links the lever member and the driven lever member and transmits a force from the lever member to the driven lever member,

wherein the driven lever member causes the beam member to move in the predetermined direction in conjunction with the movement of the moving member.

**10**. The image forming apparatus according to claim **1**, wherein when the first mechanism causes the first unit and the second unit to move away from each other, the second mechanism causes the second unit and the third unit to move away from each other and also causes the first unit and the third unit to move away from each other.

**11**. The image forming apparatus according to claim **10**, wherein a distance between the first unit and the second unit in a state where the first unit and the second unit move farthest from each other is less than a distance between the first unit and the third unit in a state where the first unit and the third unit move farthest from each other.

**12**. The image forming apparatus according to claim **1**, wherein when the first mechanism causes the second unit to move away from the first unit, the second mechanism causes the third unit to move away from the second unit.

**13**. The image forming apparatus according to claim **12**, wherein the second mechanism causes the third unit to move away from the second unit, and also causes the third unit to move away from the first unit.

**14**. The image forming apparatus according to claim **1**, further comprising an opening through which

the second unit is detachably mounted to the apparatus main body.

**15**. An image forming apparatus, comprising:

an apparatus main body;

a image forming unit that forms a developer image, the image forming unit comprising a first unit, a second unit detachably mounted to the apparatus main body, and a third unit;

a first mechanism that causes the first unit and the second unit to move toward or away from each other, the first mechanism including a beam member that supports the second unit;

a moving member that moves the first mechanism;

a linking lever member that includes a rotation support portion disposed at an end portion of the linking lever member, a mounting hole connected to the third unit, and an engagement hole provided between the rotation support portion and the mounting hole, the engagement hole receiving a force applied by the beam member, and that causes the third unit and the first mechanism to move in conjunction with each other, the third unit being rotatably connected to the linking lever member; and

a movement restriction member that restricts a movement of the end portion of the linking lever member relative to the apparatus main body,

wherein when the first mechanism moves, the beam member of the first mechanism applies the force on the engagement hole and causes the linking lever member to rotate about the rotation support portion, and moves the second unit and the third unit toward or away from each other, and

wherein a moving amount of the third unit is larger than a moving amount of the second unit.

**16**. The image forming apparatus according to claim **15**, wherein the linking lever member causes the second unit and the third unit to move in a direction away from the first unit,

and also causes the third unit to move away from the second unit in conjunction with the movement of the first mechanism.

**17**. The image forming apparatus according to claim **15**, wherein the first unit is a transfer unit.

**18**. The image forming apparatus according to claim **15**, wherein the second unit is a process unit including an image bearing body that bears a developer image.

**19**. The image forming apparatus according to claim **15**, further comprising an image bearing body,

wherein the third unit is an exposure unit provided so as to face the surface of the image bearing body, the exposure unit being configured to emit light to expose the surface of the image bearing body.

**20**. The image forming apparatus according to claim **15**, further comprising an opening,

wherein the moving member is a cover portion configured to open and close the opening.

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